Cedex® XS

User Manual

INNOVATIS

QUALITY THAT COUNTS

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Intended Use

The Cedex XS Analyzer determines the cell concentration and viability of cell suspensions. **The Cedex XS Analyzer is intended for life science research only. It is not intended for use in diagnostic procedures.** It was neither developed nor validated by the manufacturer for any kind of *in vitro* diagnostic application.

Declaration of Conformity

CE	The instrument meets the requirements laid down in Council Directive 2004/108/EC relating to “Electromagnetic Compatibility” and Council Directive 2006/95/EC relating to “Low Voltage Equipment”. The following standards were applied: IEC/EN 61326-1 (EMC), IEC/EN 61010-1 (Safety)
c UL us LISTED	The product meets US and Canadian safety requirements for electrical equipment for measurement, control and laboratory use. Issued by Underwriters laboratories, Inc. (UL) for Canada and the US. UL 61010-1 Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements CAN/CSA-C22.2 No. 61010-1 (Second Edition) Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements

FCC Notification

WARNING
Changes or modifications to this unit not expressly approved by the party responsible for compliance may void the user’s authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Safety Instructions

WARNING
It is important that the following safety instructions and guidelines be observed in order to ensure safe and reliable operation of Cedex XS:

- Place the device on a dry and sturdy surface, free of vibrations.
- Prevent the device from getting wet.
- Protect the device from dust and smoke.
- Do not expose the device to direct sunlight.
- Ensure there is sufficient air circulation around the Cedex XS System during operation (particularly around the computer and monitor).
- Operate within a constant temperature range of +50°F to +100°F (+10°C to +40°C).
- Cedex XS should only be used with the supplied or specified devices (Cedex XS Analyzer, Cedex XS Software, and computer).
- Only trained personnel in a controlled laboratory environment should operate the Cedex XS System.
- All services and repairs should be performed by authorized service technicians only.
- Always observe the safety regulations when handling Trypan Blue.
- Waste contaminated with tissue or cells, e.g. Cedex Smart Slides, pipette tips, etc. must be disposed of according to the recommended rules for handling biohazard materials.
- Only use the Cedex Smart Slide from Roche Innovatis AG for the conveyance of cell samples to the Cedex XS.

Other slides can cause irreparable damage to Cedex XS!

- The Cedex Smart Slide is designed for single use only.
- Always wear protective clothing, particularly gloves, when handling samples.
- Dirt or dust particles should not gain access into the device.
- Ensure that all equipment required for sample preparation, e.g. Cedex Smart Slides, pipette tips, etc. are stored in a dust-free environment since coarse dust particles can affect the image quality.
- Check that the Cedex Smart Slide is free of contamination before use. Only clean slides can guarantee optimal functioning of the Cedex XS Analyzer.
- Ensure that the Trypan Blue solution is free of contamination, otherwise filter prior to use.
- Secure your measurement data.
- Avoid looking directly into blue LEDs located on the front of the Cedex XS Analyzer as long as they are active. Extended and close contact to the LEDs may be harmful to the eyes!

WARNING
Installed anti-virus software should never be set up to scan the DB directory and especially not the FDB file itself!

NOTE
The software and hardware of your Cedex XS can differ from the information described here, but this should not make a difference to the operational functions in general.

WARNING
The manufacturer is not responsible or liable for any damages resulting from improper use or failure to comply with the regulations in the operating instructions.

1 Introduction

The Cedex XS determines the cell concentration and viability of cell suspensions semi-automatically. The analysis is based on the Trypan Blue exclusion method whereby cell suspensions are stained and analyzed with regard to the number of live and dead cells. The data obtained allows for the evaluation of the overall state of a cell culture, including specific growth rate and doubling time of a cell population, as well as documentation of the cultivation process.

Many parameters, including **viable cell concentration**, **total cell concentration**, **viability**, **object count**, **average compactness** and **average diameter** are analyzed using result data from the images. In addition, the **aggregate rate**, which shows the percentage of the total number of cells that appear in aggregates (clusters), is calculated.

Graphical representations of the measurement results can be viewed in the **Diameter Histogram**, **Compactness Histogram**, **Aggregate Histogram** and **Cultivation Time Chart**. The **Cell Diameter Histogram** shows the diameter distribution of the living cells. An additional diameter histogram, the **Object Diameter Histogram**, shows the diameter distribution of all objects detected such as cells and debris, as well as viable and dead cell aggregates. The deviation of the shape of living cells from that of an ideal sphere is represented in the **Compactness Histogram**. The **Aggregate Histogram** gives an overview of the amount and distribution of aggregation found in the cell culture.

The Cultivation Time Chart displays the growth curves and cultivation parameters in a time-dependent manner. The Cultivation Time Chart includes calculations for the **doubling time** [T] and **specific growth rate** [µ], and the results can be separately printed out. For further processing of results in other programs, it is possible to export the data into formats such as DIF (Data Interchange Format, Excel-compatible), CSV (Comma Separated Values, generally applicable), SML and flat file.

The use of a Live Operator makes it possible to directly observe the effects on the analysis of a sample when parameters affecting the analysis of the images are adjusted.

The image acquisition of the samples takes place in the analyzer. The 8 sample chambers of the Cedex Smart Slide have been specially developed for the analysis of a defined volume of cell suspension. The analysis software is installed on a computer and controls the analyzer (see Figure 1). It also controls the analysis and evaluation of the images obtained. The Cedex XS Software can be operated on Windows XP Professional or Windows Vista (Home Premium and Business versions).

The analysis software and its graphical user interface (GUI), known as the **Cedex XS Control Center,** enables the user to work with the Cedex XS.The Cedex Software needs to be installed on a computer that is provided either by the user or by Roche Innovatis AG.

The software analyzes the digital images provided by the analyzer. The determination of the number of viable cells (cells/mL) and cell viability of cell suspensions (the percentage of viable cells found in the total cell sample) is a semi-automated procedure based on the manual Trypan Blue Exclusion Method, which is based on the principle that viable cells will not take up the dye, while dead or dying cells have a compromised membrane that allows for the uptake of the dye. Thus, dead cells will appear darkly stained. The analysis software recognizes structures and identifies particles, thus differentiating cells from cell debris and dirt particles. The image processing is integrated into the **Cedex XS Control Center** in such a way that the user can constantly check on its function in the system.

NOTE
Trypan Blue has a greater affinity for serum proteins than cellular proteins. If the image has a dark background due to high quantities of stained serum proteins, centrifuge the cell sample and re-suspended it in a protein-free medium or physiological saline solution prior to counting.

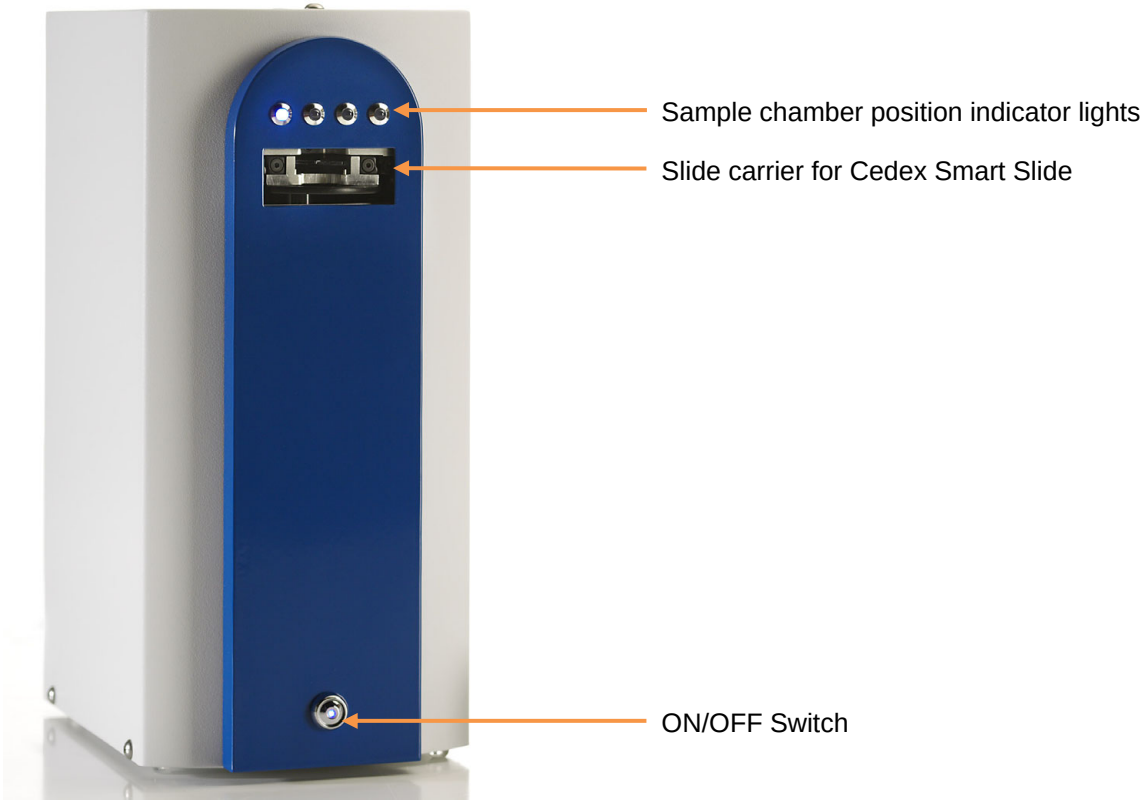


Figure 1
The Cedex XS Analyzer

2 Working with the Cedex XS

2.1 Switching on and Shutting Down

Switching on the analyzer and starting the Cedex XS Control Center

Proceed as follows:

1. Switch on the Cedex XS Analyzer.
2. Switch on the monitor and the PC or laptop.
3. Double-click on the Cedex XS icon on the desktop to launch the software. The **Cedex XS Control Center** appears after a successful launch of the program, and the user has access to all functions.

WARNING
Cedex XS hardware components must be switched on before starting the Cedex XS Software. Otherwise, the analysis software will not be correctly initialized.

Shutting down the Cedex XS Control Center

Proceed as follows:

1. Shut down the software by choosing **Exit** under the **System menu** or by clicking on to close the window. The security query, “Do you really want to exit the Cedex XS Control Center?” will appear.
2. Click on **Yes** to shut down the program.
3. Switch off the individual devices at random.

2.2 Description of the Cedex XS Control Center

The **Cedex XS Control Center** is divided into three elements (see Figure 2):

- **Menu** bar
- **Shortcuts** area
- **Event** window detailing status of events carried out by the analyzer

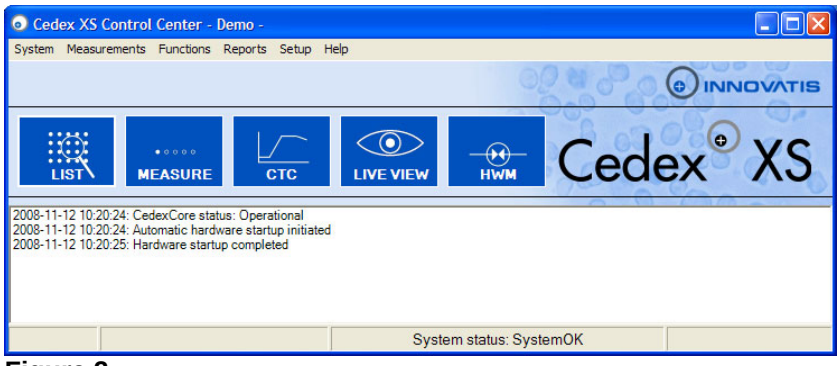


Figure 2
The Cedex XS Control Center

Menu Bar

The menu bar at the top of the Control Center has the following menu items:

- System
- Measurements
- Functions
- Reports
- Master Data
- Setup
- Help

System Menu

- **Exit**: exits the Cedex XS Control Center.

Measurement Menu

- **Measurement List**: Provides a list of all measurements that have been carried out. Measurements can be sorted or filtered using specific criteria.
- **Measurement**: Opens a window in which measurements can be run.
- **Cultivation Time Chart**: Opens a window in which multiple measurement series can be analyzed in graphical form.

Functions Menu

- **Operational Data**: The operating hours and number of measurements that have been carried out are tracked in this window.
- **Live View**: Opens a window that provides a live view of the sample chamber.
- **Hardware Management**: Execute start-up and shutdown of the hardware in this window.
- **Export to File**: Measurement results can be exported into various formats, including Excel.
- **Archiving**: Data from the database can be archived or restored.
- **Data Exchange**: Data can be imported or exported from the database of one system to the database of another system.

Reports Menu

Reports can be generated for the following types of information:

- **Operational data**
- **Measurement data**
- **System configuration parameters**

Setup Menu

- **Cell type list**: For the creation of customized cell types.
- **Diagnosis**: At the request of Roche Innovatis AG support, a diagnosis of the entire system can be run with the options listed in this window.
- **Trace and Logging**: At the request of Roche Innovatis AG support, logs of various functions of the system can be created in this window.
- **User preferences**: User preferences can be set for default parameters such as measurement parameters, measurement lists and the Cultivation Time Chart.

Help Menu

The **Help** menu provides general information about the analysis software.

Shortcut Area

Several buttons that act as short-cuts to certain functions are available in this area, including:

- **LIST**: Opens the **Measurement List** window.
- **MEASURE**: Opens the **Measurement** window for running a measurement.
- **CTC**: Opens the **CTC Views** window for setting up and viewing Cultivation Time Charts.
- **LIVE VIEW**: Opens a window that shows a live view of the selected sample chamber.
- **HWM**: Opens the **Hardware Management** window.

Tracking status of events carried out by the analyzer

The status of events that have been carried out by the analyzer is tracked in the **Event** window below the **Shortcut** area. If, for example, the hardware management has started, the completion of the routine will be noted in this window. Previous events can be viewed by using the scroll bar on the right. The window is cleared each time the software is shut down.

2.3 Carrying out a Measurement

Open the **Measurement** window by clicking on the **Measure** button in the **Shortcuts** area or by selecting **Measurement** in the **Measurements** menu (see Figure 3). Specify the desired operation and sample parameters in the entry areas of the **Sample Parameters** and **Processing Parameters** sections of the **Measurement** window. The parameters should be entered just before measuring in order to ensure a direct relationship between the sample and the data.

WARNING

Before carrying out a measurement, ensure that a **HW Startup** was automatically performed by the system when the software was launched (see “Performing a HW Startup ”).

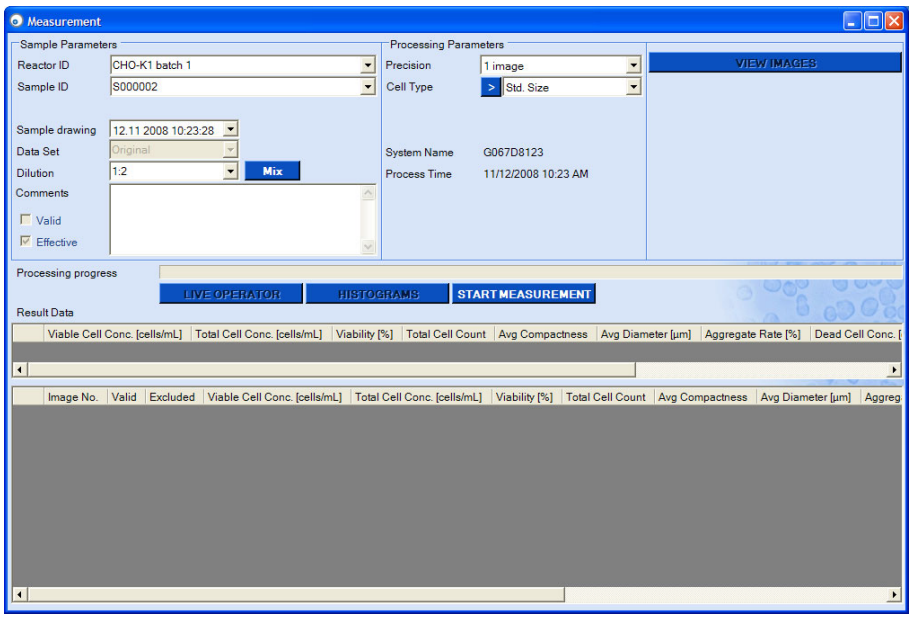


Figure 3
The Measurement window

Defining the sample parameters

The sample parameters are defined in the **Sample Parameters** area of the **Measurement** window as follows:

1. Enter a clearly defined Reactor ID to describe the sample (e.g. the name of the cell culture) in the **Reactor ID** area. You may either choose a Reactor ID from the drop down list or enter a new Reactor ID. A new entry can be defined by up to 21 alphanumerical symbols.
2. Enter a clearly defined Sample ID in the **Sample ID** area (e.g. P001). The Sample ID can be freely defined. If the intended measurement has the same Reactor ID as a previous measurement, the analysis software will automatically enter the consecutive Sample ID into the **Sample ID** area (e.g. P001, P002, ...). However, the Sample ID can be manually changed if a different Sample ID is preferred.
3. (Optional) Use the **Sample Drawing** drop-down menu to select the date when the sample was drawn.
4. Click on the **Mix** button. A window will open in which the amounts of cell sample, diluent and trypan blue used to prepare the sample can be entered in µL (see Figure 4). After the appropriate volume has been entered for each element, the dilution factor is automatically calculated.
5. Click on **OK** to confirm the entries. The window will close and the appropriate dilution factor will be automatically entered into the **Dilution** field in the **Measurement** window.

Note

NOTE

The cell concentration after all dilutions should be no greater than 5 x 10^6 cells/mL.

6. (Optional) Enter remarks in the **Comment** box in the **Sample Parameters** area.
7. The system name, as well as the process date and time of the measurement, will be automatically added to the **Processing Parameters** area.

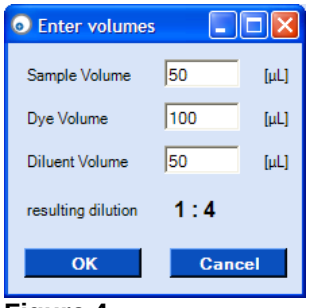


Figure 4
Window for calculation of dilution factor

Defining the measurement and analysis (process) parameters

The measurement and analysis parameters are defined in the **Processing Parameters** area of the **Measurement** window. In principle, all routine measurements can be carried out using the standardized, factory set, default settings.

Follow the instructions below to change the settings:

1. Select the Cell Type that optimally recognizes your cells or objects from the **Cell Type** drop-down list. The following cell types are available by default (see “Adjustment of

Image Analysis with the Live Operator" for more details about cell types):

- **Std. Size** for the identification of live and dead cells
- **Objects** for the identification of objects

If a new Cell Type has been created, it can also be selected from the same **Cell Type** drop-down list. Detailed information on how to create a new Cell Type can be found in "Adjustment of Image Analysis with the Live Operator".

2. Select the desired precision in the **Precision** drop-down list. The precision level determines the number of sample chambers to be analyzed for a single measurement. The results from each chamber analyzed will be combined to give an overall result. Results from up to 8 sample chambers can be combined for a single measurement. A higher number of samples per measurement requires a somewhat longer measurement time, but more cells will be counted, which will lead to a more precise calculation.

Preparing the sample and starting the measurement

Once the sample and processing parameters have been defined, the sample can be prepared and the measurement started.

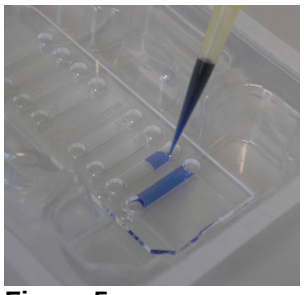


Figure 5
Adding sample to the sample chamber

To prepare the sample, carry out the following steps:

1. Prepare the cell sample by staining the sample with the appropriate amount of 0.2% trypan blue (typically a 1:1 dilution). It may be necessary to first dilute samples with very high cell densities (greater than 1 x 10^7 cells / mL) with media or phosphate buffered saline (PBS) prior to staining with trypan blue.
2. Mix the sample well, then immediately remove 10 µL and add it to the appropriate sample chamber of the Cedex Smart Slide (see Figure 5).
3. If more than one sample is to be analyzed for a single measurement, pipette 10 µL into each sample chamber to be used. Mix the cell suspension thoroughly before removing a sample for each chamber.
4. Place the Cedex Smart Slide in the Slide carrier in such a way that the sample chambers containing the samples are placed toward the Cedex XS (see Figure 6).

NOTE
Four sample chambers (e.g. chambers A1-A4) can be measured without removing the Smart Slide from the Slide carrier. To measure the other four sample chambers (e.g. sample chambers B1-B4), the Smart Slide must be removed from the Slide carrier, turned around then placed back into the Slide carrier so that those chambers are positioned towards the Cedex XS.

The Cedex Smart Slide is designed for single use only!

NOTE
To achieve optimal results with smaller cells (average diameter of approximately 10 µm or less), it may be necessary to allow the cells to settle for 1-3 minutes in the sample chamber before carrying out a measurement.

5. Push the Slide carrier into the correct position. A soft click can be felt when positioned correctly. The chamber position indicator lights will indicate which chamber is in position under the microscope: one light indicates that sample chamber position 1 is placed under the microscope and will be measured, two lights indicate sample chamber position 2 is in place, etc. (see Figure 7).
6. Click on the **Start Measurement** button to start the measurement.

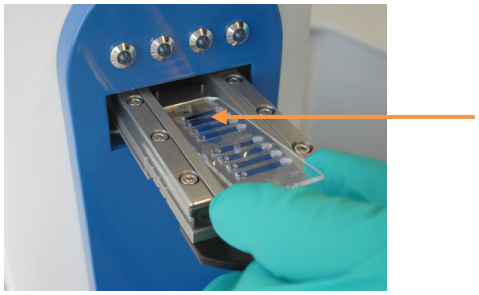


Figure 6
Placing the Cedex Smart Slide into the Slide carrier

Figure 7
Chamber position indicator lights

The progress of the measurement is tracked in the **Processing Progress** bar in the **Measurement** window. When the measurement is finished, the following message will appear: “Measurement is done”. Click on **OK** to close the window and view the results.

If multiple samples are to be analyzed for a single measurement (i.e. the **Precision** level has been set to 2 or more), the following message will appear after each sample chamber measurement is finished: “Please switch to the next chamber of the inserted slide and press “OK”” (see Figure 8). Push the Slide carrier in so that the next sample chamber is correctly positioned and click on **OK**. The measurement of the new sample chamber will automatically start. Continue with measurements until all sample chambers for that measurement have been analyzed. After the final measurement has finished, click on **OK** to confirm the message “Measurement is done”.

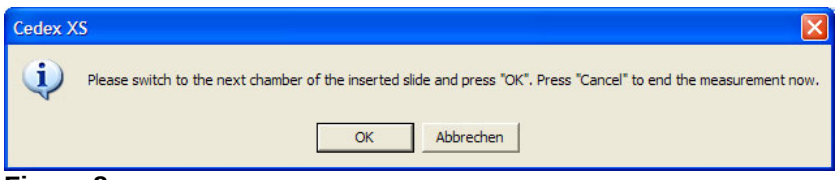

Cedex XS
Please switch to the next chamber of the inserted slide and press "OK". Press "Cancel" to end the measurement now.
OK
Abbrechen

Figure 8
Message for switching the sample chamber

NOTE

The Cedex XS can determine cell concentrations in the range of between 1 x 10^4 to 1 x 10^7 cells/mL. Any higher concentration requires a manual dilution. Cells with a diameter range of between 5 µm to 180 µm can be assessed accurately. Object recognition performance lies between 2 µm and 180 µm.

WARNING

Samples should not be left in the sample chamber for more than 15 minutes before measuring! If samples are left for longer than 15 minutes, evaporation may occur and lead to inaccurate results.

End of the Measurement

The results from the analysis are displayed in the **Measurement** window after the measurement is finished (see Figure 9). The top section of the **Result Data** area displays the overall results of the measurement. If more than one sample chamber was used for the measurement, the bottom section displays, in succession, the results from each sample chamber analyzed. When a line is selected in the list of results from single sample chambers, the corresponding image will be displayed in the **Image** area (see “Image area"). The results of the measurement can be directly printed out via the **Print** button in the middle of the **Measurement** window.

To set up a new measurement, click on the **New Measurement** button. If the next measurement belongs to the same **Reactor ID** as previous measurements, the consecutive **Sample ID** will be automatically entered into the **Sample ID** area by the analysis software without further entries being necessary. If a different **Sample ID** is desired, the new **Sample ID** can be typed in manually.

3 Analyzing the Measurement Results

3.1 The Measurement Results Window

Measurement results are displayed in the **Measurement** window (see Figure 9). The analysis results obtained from a measurement are automatically displayed in the same window after the analysis process is completed. Measurement results from past measurements can be viewed via the **Measurement List** window (accessed using the **List** button in the **Shortcuts** area; see "Using the Measurement List" for more details about working with the **Measurement List**).

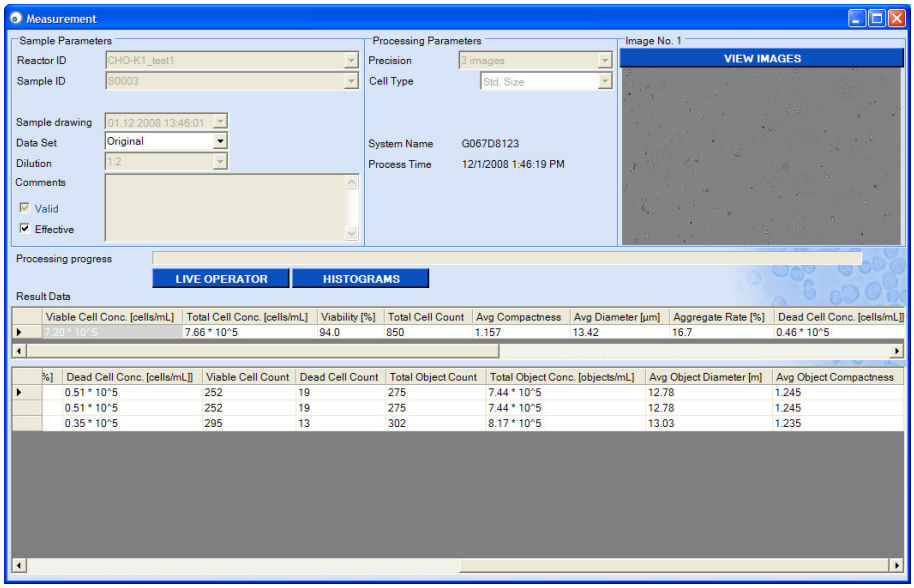


Figure 9
The Measurement window with results

The **Measurement** window has 4 areas (see Figure 9):

- **Result Data** area
- **Sample Parameters** area
- **Processing Parameters** area
- **Image** area

Some of the results can be displayed as histograms by clicking on the **Histograms** button (see "Graphical Display of the Analysis Results"). It is also possible to access the Live Operator via the **Measurement** window using the **Live Operator** button (see "Adjustment of Image Analysis with the Live Operator").

Result Data area

The **Result Data** area in the bottom half of the **Measurement** window has two separate sections:

1. The section just beneath the words **Result Data** displays the overall results for the measurement.
2. If multiple sample chambers were used for a single measurement the bottom section of the **Result Data** area will display the results for each sample chamber analyzed. If only one sample chamber was used for a measurement, the results for that sample chamber will appear in the section below.

The following parameters are shown in the **Result Data** area for both the overall results and individual sample chamber results:

- **Viable Cell Conc.**: Concentration of viable cells [x10 ^{5} cells/mL].
- **Total Cell Conc.**: Total cell concentration [x10 ^{5} cells/mL].
- **Viability (%)**: The proportion of viable cells (%) to the total number of cells (viable and dead cells).
- **Total Cell Count**: The number of all detected objects counted as cells.
- **Avg Compactness**: The average variation, in shape, of viable cells from an ideal sphere, with the ideal sphere shape equaling >1<.
- **Avg Diameter**: The average diameter [µm] of viable cells detected.
- **Aggregate Rate (%)**: Specifies the percentage of all cells (Total Cell Count) found in aggregates (clusters).
- **Dead Cell Conc.**: Dead cell concentration [x10 ^{5} cells/mL].
- **Viable Cell Count**: The number of viable cells counted.
- **Dead Cell Count**: The number of dead cells counted.
- **Total Object Count**: The number of all detected objects counted.
- **Total Object Conc**.: Total object concentration [x10 ^{5} cells/mL].
- **Avg Object Diameter**: The average diameter [µm] of objects detected.
- **Avg Object Compactness**: The average variation, in shape, of objects from an ideal sphere, with the ideal sphere shape equaling >1<.

Sample and Processing Parameters areas

The **Sample Parameters** area of the **Measurement** window shows the parameters entered by the user before running the measurement. If any measurements have been reprocessed, the original or reprocessed results can be selected in the drop-down menu of the **Data Set**. If a measurement has been reprocessed at some point, the **Effective** checkbox will indicate which data set has been determined to be the effective version (see “Reprocessing a measurement”).

The **Processing Parameters** area lists the process parameters of the measurement, including **Cell Type**, used to analyze the images (see “Adjustment of Image Analysis with the Live Operator”), the precision selected (see “Defining the measurement and analysis (process) parameters”) and the date and time the process was run.

Image area

Viewing cell images

The Cedex XS Software enables a close view of an image or an enlarged image display for evaluation. Images are viewed in the **Image** area of the **Measurement** window. When a row with the results of a particular sample chamber is highlighted in this section, the image connected with those results is displayed in the **Image** area. To see a different image in this area, click on a different row in the **Result Data** area.

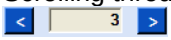
Only one image is displayed in the **Image** area of the **Measurement** window. Click on the **View Images** button to open the **Image List** window, which contains thumbnails of the images from all sample chambers used for the calculation of results.

Double-click on a thumbnail in the **Image List** window to open a new window, called the **Image View**. This window contains an enlarged version of the selected image, as well as some further options for viewing the image. Double-clicking on the image displayed in the **Image** area of the **Measurement** window will also open the **Image View** window.

Viewing a cell image using the Image View window

In the **Image View** window, it is possible to see which cells were marked as viable or dead by the analysis software. The user can also see how the software analysis evaluated cell shapes and clusters. The Cedex XS Software offers a variety of options for adjusting and optimizing the image analysis software in case of unusual cell culture images or for specific internal counting strategies. Detailed information can be found in the chapter “Adjustment of Image Analysis with the Live Operator”.

The **Image View** also provides the following information and options:

- **Viable Cells**: number of viable cells.
- **Dead Cells**: number of dead cells.
- **Show Circles** check-box: switches on/off the marking of cells recognized as living or dead. Viable cells are marked with a uniform green circle and dead cells are marked with a red circle. The circle diameter corresponds to the cell diameter. Objects are marked with a blue circle.
- **Zoom**: Image enlargement.
- **Brightness** and **contrast** settings.
- Scroll bars for navigating a window when the image is enlarged (scroll bars will appear at the bottom and right edge of the image when the image is enlarged).
- Scrolling through all of the images for a particular measurement using the arrows  in the lower right-hand corner.

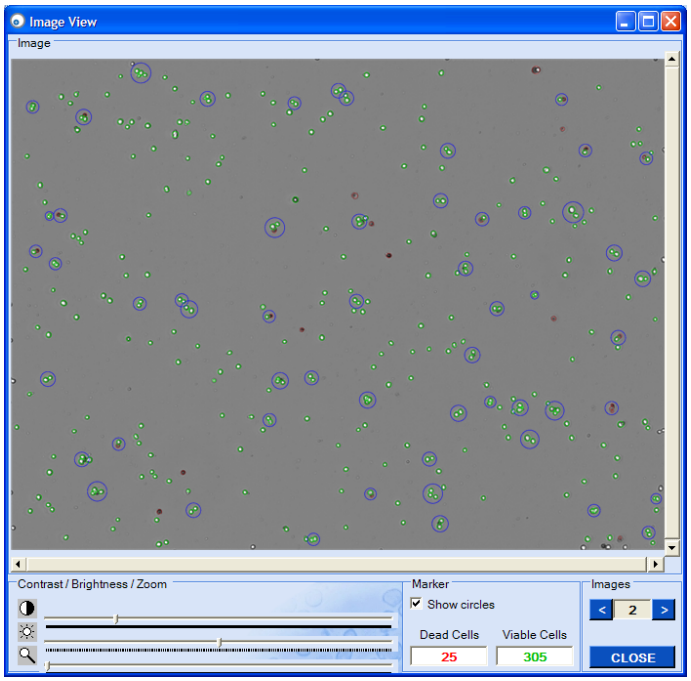


Figure 10
*Viewing a cell image using the **Image View** window*

Certain areas of the image can be enlarged by doing the following:

1. Place the mouse pointer at the top left-hand corner of the area to be enlarged.
2. Hold the left mouse button pressed down and move it to the lower right-hand corner of the area to be enlarged.

3. Release the mouse button. The selected area will fill the whole window.

To return to the original size of the image, do the following:

1. Place the mouse pointer anywhere in the image.
2. Hold the left mouse button pressed down and form a box from the bottom right corner to the upper left corner.
3. Release the mouse button. The image will return to in its original size.

Click on **Close** to shut the window or use the button.

Excluding images from the evaluation process

Images from individual sample chambers used for a single measurement can be excluded from analysis by the user. Exclusion and inclusion of images for a particular measurement can be done via the check-box in the **Excluded** column in the **Result Data** area of the **Measurement** window. A check in the **Excluded** check box means that the cell image has been excluded from the calculation process. The overall results will only be calculated for images that are not excluded.

3.2 Using the Measurement List

Data from measurements that have been run in the past can be accessed via the **Measurement List** window. Open the **Measurement List** either by clicking on the **List** button in the **Shortcuts** area of the **Cedex XS Control Center** or by selecting **Measurement List** in the **Measurements** menu at the top of the **Control Center**.

A number of actions can be carried out in the **Measurement List** window including searching for measurements using a number of different filters, viewing measurements, printing reports, exporting measurements and reprocessing measurements.

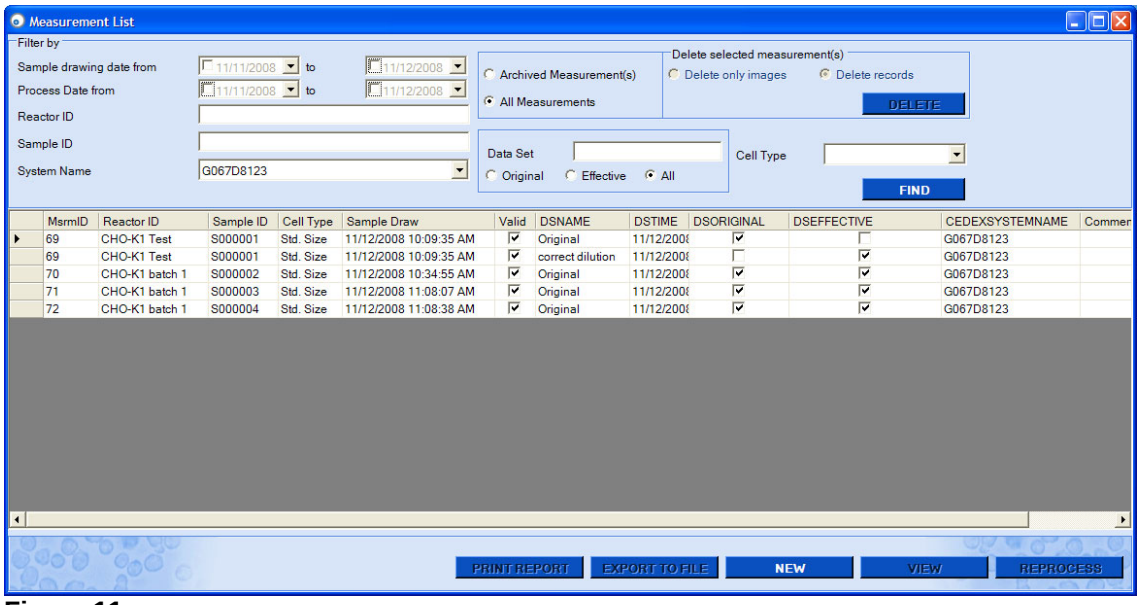


Figure 11
Measurement List window

Viewing existing measurement results

Existing data sets may be viewed by highlighting the row containing the desired measurement and clicking on the **View** button in the bottom right-hand corner of the **Measurement List** window. A **Measurement** window will open containing all of the relevant results for the selected measurement (see “The Measurement Results Window”).

Searching for measurements

It is possible to search for specific measurements using a number of different filter criteria including sample drawing date, process date, Reactor ID, Sample ID, system name and Cell Type in the **Filter By** area at the top of the **Measurement List** window. To search for measurements based on various criteria, do the following:

1. Click on the drop-down menu button next to the **Sample Drawing Date From** or **Process Date From** sections. A calendar will appear in which the desired starting date for filtering can be selected.
2. When a date has been selected, a check will appear in the check-box next to the date to indicate that a filter is active based on that date.
3. Click on the drop-down menu button next to the second check box in order to select the desired ending date.
4. Once the dates for filtering the measurements have been selected, click on the **Find** button in the middle of the **Measurement List** window.
5. All of the measurements that match the dates given for sample drawing (using the **Sample Drawing Date From** section,) or that were run within the dates specified in the **Process Date From** section, will be displayed in the measurement list in the bottom half of the window.

It is possible to select measurements with regard to both sample drawing date and process date. If starting and ending dates for both sample drawing and process dates are selected, only those measurements that meet all 4 date criteria will be displayed when the **Find** button is clicked on.

Measurements can also be searched for based on **Reactor ID** and/or **Sample ID** by filling in the information in these sections of the **Filter By** area. In addition, it is possible to filter measurements according to data set (in the **Data Set** area) and Cell Type (using the drop-down menu in the **Cell Type** section).

NOTE

If a measurement has been reprocessed, the original and all reprocessed versions of the measurement will be listed. The data set of a particular measurement that has been selected as the **Effective** data set will have a check in the check-box of the **DSEffective** column. The original data set of a particular measurement will have a check in the check in the check-box of the **DSOriginal** column (see “Effective data sets”).

3.3 Reprocessing Existing Analysis Results/Data Sets

In addition to analysis, the Cedex XS Software also allows for modification and reprocessing of existing measurement results or data sets. These changes are done on existing software data (image and analysis results) and, therefore, do not require any adjustments to the analyzer.

Reprocessing a measurement

Reprocessing existing measurement results/data sets, i.e. viewing a set of image data and re-evaluating them with new analysis parameters, is done in the **Reprocess** mode via the **Reprocess** button in the lower right-hand corner of the **Measurement List** window.

The reprocess mode offers the following options:

- Correct the dilution (see “Defining the measurement and analysis (process) parameters").
- Change the Cell Type (see “Defining the measurement and analysis (process) parameters" for a list of available cell types).

Follow the instructions below to reprocess existing data sets with changed analysis parameters:

1. Click on the **List** button in the **Cedex XS Control Center** to open the **Measurement List** window.
2. Highlight the row of the measurement to be reprocessed and click on the **Reprocess** button in the lower right-hand corner. A **Measurement** window will open containing all of the result data for that measurement.
3. Enter a new name for the data set in the **Data Set** section of the **Sample Parameters** area.
4. Ensure that there is a check-mark in the **Effective** check-box if the new data set should be used as the effective data set (see “Effective data sets”).
5. Make the desired changes to the new data set. Changes can be made with regard to the dilution factor and Cell Type in the appropriate sections of the **Sample Parameters** and **Processing Parameters** areas.
6. Click on the **Reprocess** button in the center of the **Measurement** window to start reprocessing the measurement based on the new parameters.
7. When the reprocessing is finished, a window will open asking whether the new data set should be the effective data set. Click on **Yes** if it should be the effective data set.

A new data set is available once the evaluation has been completed. All changes can be retraced by viewing previously created data sets.

NOTE
The reprocessing procedure creates additional data sets. Original data is not overwritten.

Effective data sets

When measurements are reprocessed, it is possible to label one of the resultant data sets as **Effective**. The **Effective** data set is the version of the measurement (original or reprocessed) that has the correct parameters. Once a data set has been selected as **Effective,** it will be labeled as such in the **Measurement List** window.

The data set to be labeled **Effective** can be later changed by doing the following:

1. Select the data set version of the measurement to be labeled **Effective** in the **Measurement List** window.

2. Click on the **Reprocess** button. A **Measurement** window will open containing the results for that data set.
3. Click on the **Effective** checkbox in the **Measurement** window. A check will appear in the box.
4. Close the **Measurement** and **Measurement List** windows.
5. When the **Measurement List** window is re-opened, the newly selected data set will appear as the **Effective** data set.

3.4 Graphical Display of the Analysis Results

The Cedex XS Software provides graphic diagrams of the results. Histograms can be viewed by clicking on the **Histograms** button in the **Measurement** window to open the main **Histograms** window. There are 4 different histograms that can be viewed via this window: **Aggregate Histogram**, **Cell Diameter Histogram**, **Compact Histogram**, **Object Diameter Histogram**. Click on the respective button to open the desired histogram.

All of the results presented in the histograms are based on valid images accepted for evaluation. This means that results from individual images that have been manually excluded by the user will not be included in the histograms (see “Excluding images from the evaluation process”).

Enlarging the histograms

Certain areas of the histograms can be enlarged by doing the following:

1. Place the mouse pointer on the top left-hand corner of the area to be enlarged.
2. Hold the left mouse button pressed down and move it to the lower right-hand corner of the area to be enlarged.
3. Release the mouse button. The selected area will fill the complete window.

Return to the original size of the histogram by doing the following:

1. Place the mouse pointer anywhere on the diagram and right-click with the mouse.
2. A small window will open with the option “Unzoom” or “Undo all Zoom/Pan”.
3. If the chart was enlarged more than once, selecting “Unzoom” will reduce the image to the point before the last enlargement. Select “Undo all Zoom/Pan” to return the histogram to its original size.

In addition, the histograms can be moved around within the window by placing the mouse pointer anywhere in the histogram, holding down the middle mouse button and moving the mouse.

Aggregate Histogram

The Cedex XS offers a thorough evaluation of aggregates in cell cultures. Click on the **Aggregate Histogram** button in the **Histograms** window to open the **Aggregate Histogram**.

The **Aggregate Histogram** shows the number of cells in the cell culture found in aggregates, as well as how many cells each aggregate is composed of. Both the actual cell number and the percentage distribution can be displayed.

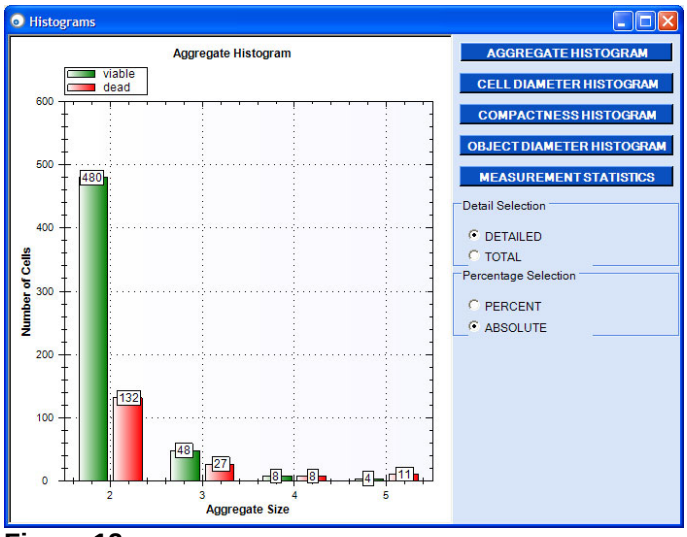


Figure 12
The Aggregate Histogram, detailed view (divided into living and dead cells), here: (absolute) number of cells

The **Number of Cells** identified in aggregates is displayed on the y-axis and at the top of the bars. The **Aggregate Size,** in terms of the number of cells per aggregate, is displayed on the x-axis. Figure 12, for example, shows that 480 living and 132 dead cells of all identified cells were found in aggregates of two cells.

The percentages can be displayed using the **percent** button. The percentage of cells [%] found in aggregates compared to the total live or dead cell count is displayed on the y-axis. The aggregate size, in terms of the number of cells per aggregate, is displayed on the x-axis.

Click on the **total** button to display **Total Cell Count** (living and dead cells combined) per aggregate, as shown in Figure 13.

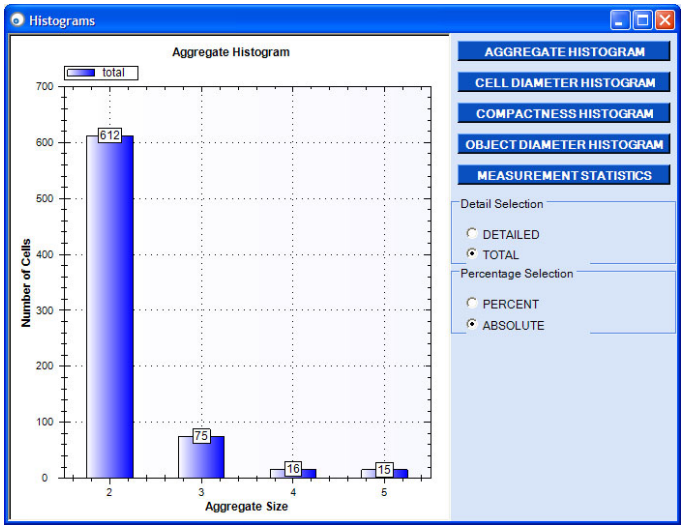


Figure 13
The Aggregate Histogram, total view (sum of living and dead cells), here: (absolute) number of cells

The percentage of cells found in aggregates, in relation to the total cell count, can also be displayed by using the **percent** button.

Cell Diameter Histogram

Click on the **Cell Diameter Histogram** button to display the Cell Diameter Histogram (see Figure 14). The Cell Diameter Histogram shows the diameter distribution of **living cells** only and is based on the individual diameters measured from all living cells detected in the measurement.

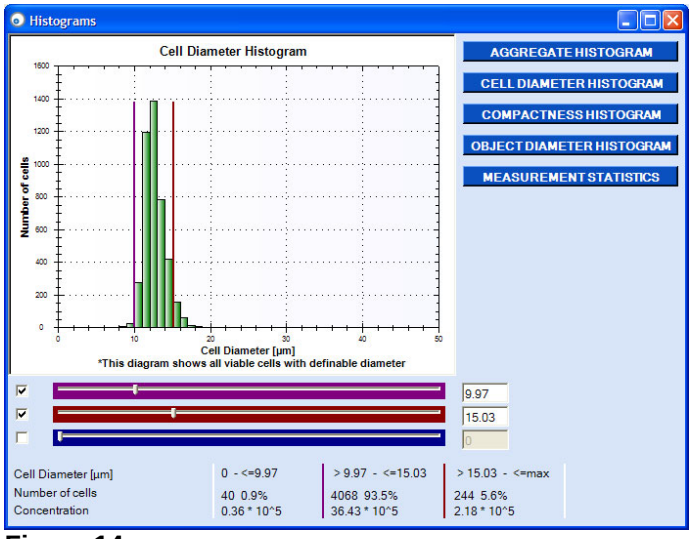


Figure 14
Cell Diameter Histogram

Object Diameter Histogram

Click on the **Object Diameter Histogram** button to open the **Object Diameter Histogram** (see Figure 15). Analogous to the representation of the diameter of the living cells, the **Object Diameter Histogram** shows the diameter distribution of all (!) recognized objects, including objects such as cells, debris, air bubbles, and viable and dead cell aggregates.

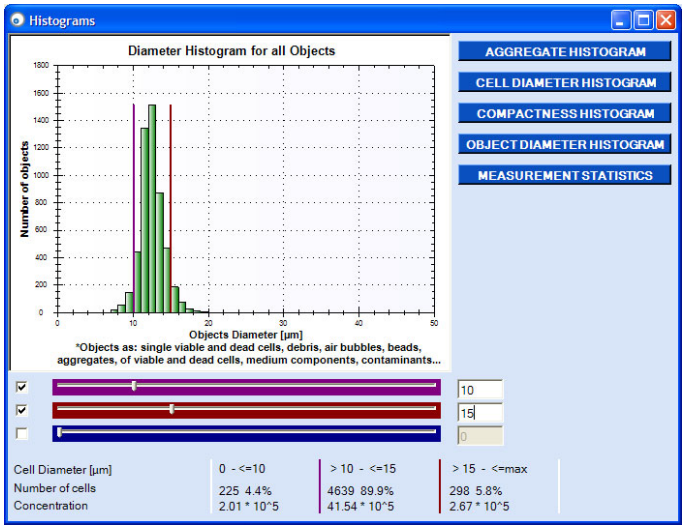

Histograms
Diameter Histogram for all Objects
AGGREGATE HISTOGRAM
CELL DIAMETER HISTOGRAM
COMPACTNESS HISTOGRAM
OBJECT DIAMETER HISTOGRAM
MEASUREMENT STATISTICS
Number of objects
Objects Diameter [µm]
*Objects as: single viable and dead cells, debris, air bubbles, beads, aggregates, of viable and dead cells, medium components, contaminants...
10
15
0
Cell Diameter [µm] 0 - <=10 > 10 - <=15 > 15 - <=max
Number of cells 225 4.4% 4639 89.9% 298 5.8%
Concentration 2.01 * 10^5 41.54 * 10^5 2.67 * 10^5

Figure 15
Object Diameter Histogram

Defining diameter intervals in the Diameter Histograms

Both the **Cell** and **Object Diameter Histograms** have three sliders that can be used to define separate diameter intervals. This allows for dividing a diameter histogram into a maximum of four parts. Activate the sliders by clicking on the corresponding boxes and moving the sliders to the desired positions. The user can also define the margins of the intervals by entering the numerical values on the right-hand side of each slider.

The borders of the first interval are defined by the minimum value and the first numerical value entered. The next two values define the upper borders of the second and third intervals. The fourth interval is defined by the upper border of the third interval and the maximum value.

The number of viable cells, their percentage of the total viable cell number and the viable cell concentrations [x10^5 cells / mL] are listed in a table for each of the individual intervals. Similarly, the number of the objects analyzed, their percentage compared to the number of all objects recognized, as well as the object concentration [x 10^5 objects / mL], are listed in a table under the **Object Diameter Histogram** for each of the individual intervals.

Compactness Histogram

The ratio between the cell circumference and the cell area is based on an ideal sphere (4π), which is equivalent to the value “1” on the abscissa of the **Cell Compactness Histogram**. The extent of variation between the cell shape and an ideal sphere is reflected in values that are greater than 1. The shape of a cell is known as the **Compactness**. Click on the **Compactness Histogram** button to display a histogram that compares **viable** (!) cell shapes to that of an ideal sphere and shows the distribution of compactness found in a the cell culture. The **Compactness Histogram** can be used to check for changes in the state of the cell culture, e.g. if the stirring speed is too high or nutrient composition is incorrect.

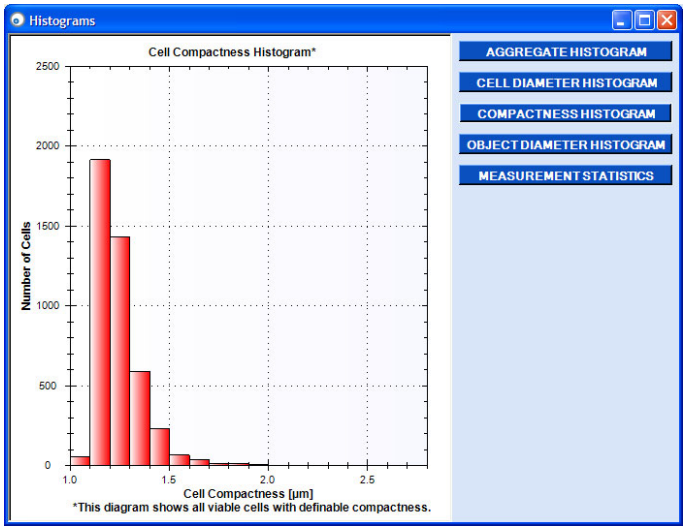


Figure 16
Compactness Histogram

3.5 The Cultivation Time Chart

Growth patterns of cell cultures can be graphically evaluated in the **Cultivation Time Chart**. Click on the **CTC** button in the **Shortcuts** area of the **Cedex XS Control Center** or select the

Cultivation Time Chart option in the **Measurements** menu to open the **CTC Views** window. In the **CTC Views** window, charts can be created, viewed, edited, exported and deleted.

A collection of data used for the creation of a particular chart is called a **View**. Each **View** can have up to 5 separate series of measurements in order to compare data.

Creating a CTC View

The **CTC Views** window has two main areas (see Figure 17):

- In **View** area charts can be viewed, exported, created and deleted. Previously created cultivation time charts can be found via the **Filter By** section located at the top of the window. The user can filter by name of the View or by the date a View was created or modified. Enter the desired parameters and click on the **Find** button. When searching by date, the check box next to the date must first be checked. After checking the box, click on the drop-down menu to the right of the date to open up a calendar in which the desired date can be selected.
- Individual series of measurements belonging to the highlighted **View** can be created, edited, listed or deleted in the **Series belonging to selected view** area at the bottom of the window.

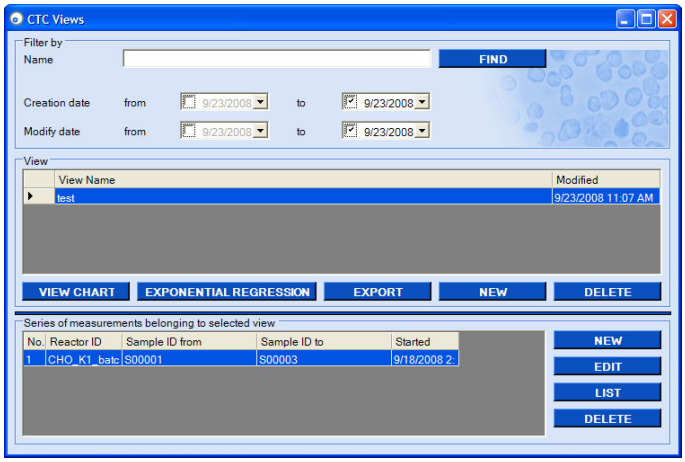


Figure 17
CTC Views window

The View Area

The **View** area in the middle of the **CTC Views** window is used for viewing, exporting, creating or deleting a View. If no filters have been set, all Views that have been created will be displayed in the **View Name** column. If filters have been set, only those Views that match the filters will appear in this column. To open the chart for a particular View, highlight the row of the desired View and click on the **View Chart** button. To create a new View, click on the **New** button. Highlighted rows of Views can also be exported with the **Export** button or deleted using the **Delete** button.

When the **New** button is selected, a window will open asking for a name for the new View. A name must be given before a View can be created. Give a name for the new View and click on **OK**. The new View will appear highlighted in the **View** area. It is now possible to select the measurements for this View using the **Series belonging to selected view** area at the bottom half of the **CTC Views** window.

The Series of measurements belonging to selected view area

Use this area to create, edit, view and delete measurements belonging to a particular View. In order add to or modify measurement series belonging to a particular View, that View must be highlighted in the **View** area.

Adding measurements to a View

Do the following to find and select measurements for a new or previously created View:

1. Highlight the View to be modified in the **View** area of the **CTC Views** window and click on the **New** button on the right-hand side of the **Series belonging to the selected view** area. This will open the **Selection of Data Series** window in which measurements can be selected for the creation of a View (see Figure 18).
2. Choose the **Reactor ID** and the preferred **Data Set** (original or effective measurement data, see “Effective data sets”).
3. Click on the **Find** button. All of the **Sample IDs** associated with that particular **Reactor ID** will appear in the upper section of the **Selection of Data Series** window.
4. Click on the empty column to the left of the measurements to be added to the series in order to highlight that measurement. Multiple measurements can be highlighted either by holding down the <shift> or <ctrl> key.
5. When all of the desired measurements have been selected, click on the **Add selected measurements** button. The highlighted measurements will appear in the bottom half of the window under the **Measurements belonging to series** area.
6. Click on **Save**. The **Selection of Data Series** window will automatically close. The **CTC Views** window will reappear and show the measurements that have been added to the View in the **Series belonging to the selected view** area.
7. To add another series to a View, click on the **New** button again. The **Selection of Data Series** window will open. Follow steps 2 – 6 above to add measurements to the new series.
8. Up to 5 separate series can be added to one View. Once 5 series have been added to a View, the **New** button will no longer be available for that View.

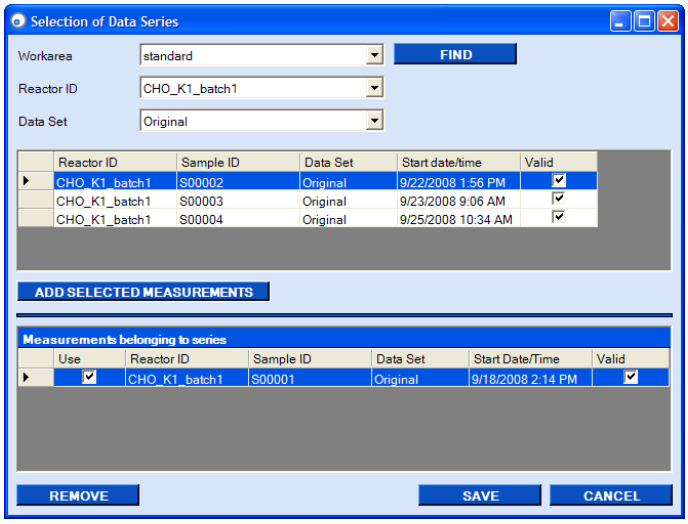


Figure 18
Selection of Data Series window

Editing measurements in a View

Measurements can be added or removed from a particular View by using the **Edit** button in the **Series belonging to the selected view** area of the **CTC Views** window. To edit the measurements belonging to a View, do the following:

1. Highlight the row of the View to be edited in the **View** area of the **CTC Views** window.
2. Highlight the particular series of the View to be edited in the **Series belonging to the selected view** area.
3. Click on the **Edit** button. This will open the **Selection of Data Series** window (see Figure 18).
4. Add measurements from the series list as described above, or remove measurements by highlighting them and clicking on the **Remove** button at the bottom of the window.
5. Click on the **Save** button. The changes will be saved and the window will automatically close.
6. The **CTC Views** window will become available and other series in the same View can now be edited.

Measurements can also be excluded from a cultivation time chart without being removed from the series. All measurements selected for a series that are marked with a (✓) in the checkbox of the **Use** column of the **Selection of Data Series** window will be displayed in the **Cultivation Time Chart**. Should a particular single measurement not be displayed in the chart, the measurement can be unselected by removing the (✓) in the **Use** column with a mouse click. The measurement will remain in the list, but not appear on the chart.

Viewing list of measurements in a series

If measurements have been added to a View, a simplified list of the series will appear in the left-hand side of the **Series belonging to the selected view** area of the **CTC Views** window. To see the full list of all measurements from all series created, click on the **List** button. This will open the **Series List** window. A search for specific measurements in the list can be done using the **Filter by** area in the upper right-hand corner of the **Series List** window. Searches can be made by Reactor ID or date of measurement. Once the filter parameters have been set, click on the **Find** button. The measurements that fit the parameters will be displayed in the **Measurements** area in the lower left-hand corner. Only series that contain measurements with the correct parameters will be displayed in the **Series** area in the upper left-hand corner of the **Series List** window.

Deleting Views and Series

Entire Views can be deleted by highlighting the View and clicking on the **Delete** button in the **View** area of the **CTC Views** window. If one series of a particular View should be deleted, highlight the relevant View in the **View** area, then highlight the series to be deleted in the **Series belonging to the selected view** area. Click on the **Delete** button in the **Series belonging to the selected view** area of the **CTC Views** window.

Exporting a View or a Series list

The series of measurements in a View can be exported via the Export button in the CTC Views window. Select the View to be exported in the **View** area of the **CTC Views** window and click on

the **Export** button. An **Export** window will open in which the desired settings and parameters can be selected. In addition, it is possible to export the measurements in an individual Series. Select the Series to be exported in the **CTC Views** window and click on **List**. The **Series List** window will open. To export the data, click on the **Export** button (see “Export to File” for more details about export options).

Creating a Cultivation Time Chart

Once a View has been created with the desired series of measurements, the Cultivation Time Chart can be created. To create a Cultivation Time Chart, do the following:

1. Highlight the View in the **CTC Views** window to be used for the creation of a Cultivation Time Chart.
2. Click on the **View Chart** button, this will open the **Cultivation Time Chart** window (see Figure 19).
3. Select the parameters to be displayed in the chart by clicking on the desired parameters in the **Data Selection** area in the upper right-hand corner of the window (see “The Data Selection Area”).
4. Select the series to be displayed in the **Chart** area in the lower right-hand corner of the window.
5. A graph will then be generated showing the selected parameters and series.

NOTE
Only measurements already loaded will be displayed in the **Cultivation Time Chart** window diagram. The **Selection of Data Series** window must be brought up again to add additional measurements.

The Data Selection Area

The curves to be displayed in the diagram are determined in the **Data Selection** area of the **Cultivation Time Chart** window. The following values can be selected for display:

- **Viable Cell Conc**.: Viable cell concentration [cells/mL]
- **Total Cell Conc**.: Total cell concentration [cells/mL]
- **Viability** [%]: Percent viability
- **Total Cell Count**: Total number of all cells counted
- **Avg. Compactness**: Average compactness of living cells [without unit]
- **Avg. Diameter**: Average diameter of living cells [µm]
- **Aggregate Rate** [%]: Percent of cells found in aggregates
- **Dead Cell Conc.**: Dead cell concentration [cells/mL]
- **Viable Cell Count**: The total number of viable cells counted
- **Dead Cell Count**: The total number of dead cells counted
- **Total Object**: The total number of objects counted

Click on the appropriate checkbox to select the desired values.

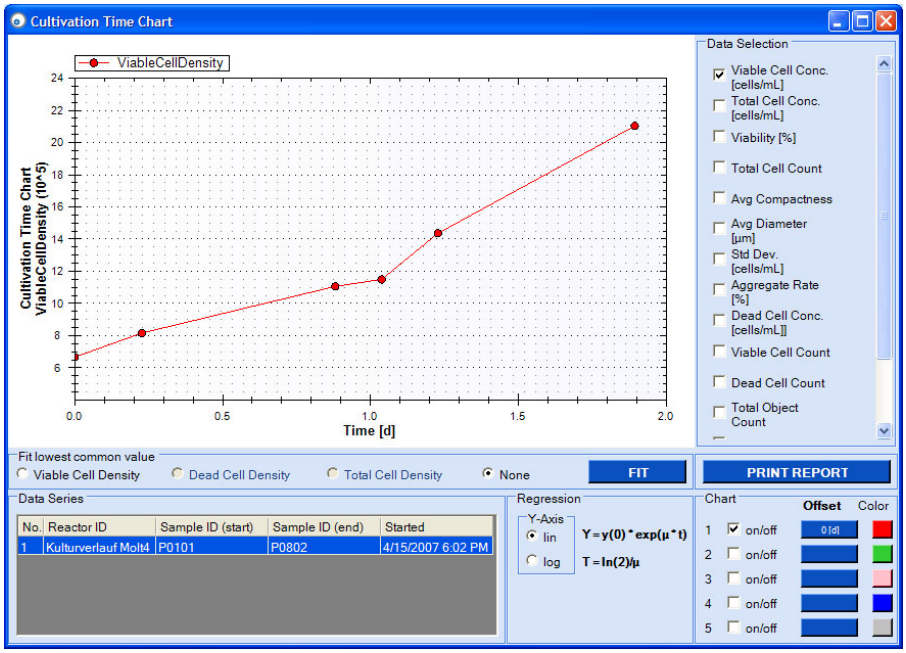


Figure 19
Cultivation Time Chart window

The measurement series, including information about which measurements have been used to create the chart, are listed in the **Data Series** area in the bottom left-hand corner of the **Cultivation Time Chart** window. A legend at the top of the graph indicates the symbol (shape and color) used for each parameter. The color used for each series is indicated in the **Chart** area in the lower right-hand corner of the window.

Place the mouse pointer exactly over a measurement point in the diagram to see detailed information about the point, including the date and time of the measurement as well as the result for that parameter. Also, the graphic representation can be enlarged or scaled down again with the use of the mouse (see “Enlarging the histograms”).

Fitting to the lowest common value

The **Fit lowest common value** button enables automatic shifting of the zero-point of single measurement series to each other. The following can be selected:

- Viable Cell Density
- Dead Cell Density
- Total Cell Density

Using this function, the zero-point of each series will be automatically shifted on the x-axis in order to be able to better compare measurement series to each other. The lowest common value for all the measurement series is automatically determined, and the graphs in the diagram are shifted to each other so that the lowest common value falls on the x-axis at the same point. While doing so, the left-most point of the graph of all the measurement points is set at value 0.

Measurement Offset

The graph automatically displays the measurement series so that all series begin at time 0. The user, however, may prefer to compare different measurement series by setting the offsets so that the beginning of the exponential growth phase (log phase) starts at the same time for all series. The Measurement Offset can be used to shift the curves in the diagram by changing the offset for each series.

A button in the **Offset** column of the Data Series area displays the offset set by the user (the button displays **0 [h]**, if no offset was set). Click on this button to open the **Measurement Offset** window. The measurement offset can be then manually shifted in this window for.

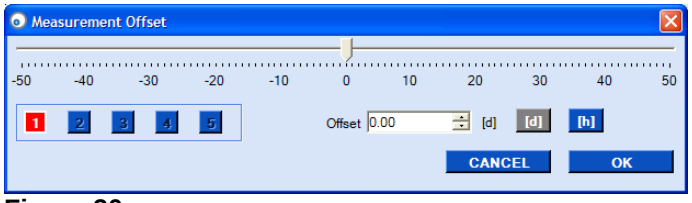


Figure 20
The Measurement Offset window

The offset can be separately entered for each of the five measurement series. Fix the offset by selecting the desired series number (colored boxes) and then moving the slider to the desired offset. Using the slider will cause an immediate shift of the measurement series in the diagram so that it can be immediately seen where the best position for a series is in the diagram.

Large time differences can be entered in days [d] and small ones in hours [h] by clicking on the appropriate buttons **[d]** /**[h]**. The smallest time unit that can be set is 0.10 hours. The **OK** button confirms the offset values for the graph.

Variable axis calibration

The buttons **lin** or **log** are used to determine whether the y-axis should display in a linear (lin) or logarithmic (log) scaling for cell density. The default value is lin.

The x-axis units can be displayed as either days **[d]** or hours **[h]**. Click on the **Time[d]** below the x-axis to switch between days and hours. The x-axis calibration is automatically recalculated.

The Exponential Regression Button

Use the **Exponential Regression** button in the **View** section of the **CTC Views** window to display cell culture growth patterns with the calculated Specific Growth Rate [µ] and Doubling Time [T]. The corresponding values appear in the **Data Series** list (see Figure 21).

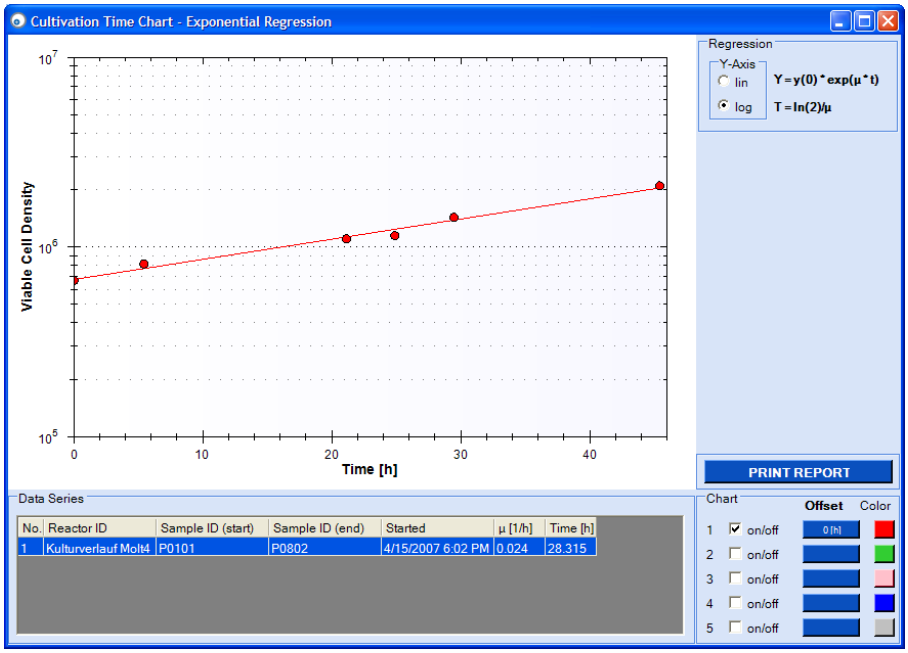


Figure 21
A view of the Exponential Regression window

Only viable cell concentration is shown in this graph. The measurement parameters **Specific Growth Rate** [μ] and **Doubling Time** [T] of the culture are computed by means of the differential curve.

Click on the to close the **Exponential Regression** window. The **CTC Views** window will reappear.

Printing and Exporting out a Cultivation Time Chart

Cultivation Time Charts can be printed out via the **Print** button in the **Cultivation Time Chart** and the **Exponential Regression** window. To print out a chart, click on the **Print** button. A window will open in which the printer settings can be selected or the chart can be directly printed. Click on the **Print** button to open a window with a preview of the page to be printed. It is also possible to export and print out the data from the **Cultivation Time Chart** (see “Export to File” for more details about export options).

4 Adjustment of Image Analysis with the Live Operator

The operator selected for a measurement takes care of the image evaluation. For various application scenarios, Roche Innovatis AG has put in two pre-settings that are adapted to a wide variety of cells and objects:

- CedexXSCellOperator for the analysis of cells, default Cell Type **Std. Size**.
- CedexXSObjectOperator for the analysis of objects, default Cell Type **Objects**.

Individual adjustments of the operator can be helpful or necessary for cell cultures that, for instance, have an unusual optical appearance or for a counting strategy that deviates from the standard counting strategy (e.g. counting aggregates or cell nuclei differently).

Adjustment of an operator is referred to as creating a new **Cell Type**. A new **Cell Type** can be created or an already existing **Cell Type** adjusted. This can be done with the help of a number of parameters that influence the way in which an image is evaluated. Each of these parameters directly influences the image processing strategy and, hence, the measurement results.

WARNING
The parameters of the factory installed pre-settings are overwritable. For data safety reasons the parameters of the factory installed pre-settings should not be altered.

4.1 Description of the Cell Type List and Live Operator

The **Live Operator** window, in which Cell Types can be created and modified, is accessed in two ways:

- Via the **Cell Type List** option in the **Master Data** menu of the Control Center.
- Via the **Measurement** window in the **View** mode.

The Cell Type List window

Select the **Cell Type List** option in the **Master Data** menu to open the **Cell Type List** window (see Figure 22). There are several options in this window including:

- **New**: Create new Cell Types
- **Edit**: Modify existing Cell Types
- **View**: View existing Cell Types
- **Delete**: Delete existing Cell Types
- **Live Operator**: Open the Live Operator window

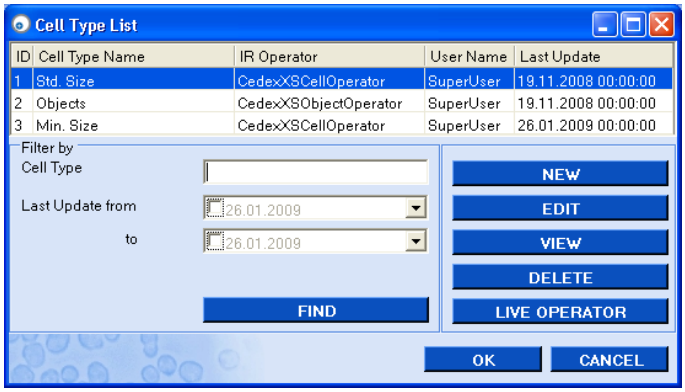


Figure 22
Cell Type List window

Creating a new Cell Type

A new Cell Type must be created and saved via the **Cell Type** window before the **Live Operator** window can be opened for modification of that Cell Type.

Do the following to create a new Cell Type:

1. Open the **Cell Type List** window. Highlight the existing Cell Type upon which the new Cell Type should be based.
2. Click on the **New** button. A message will appear asking if the new Cell Type should be based on the highlighted Cell Type in the list. Click on **Yes**. The **Cell Type** window will open (see Figure 23). The **Live Operator** button will be inactive at this time.
3. Fill in the information for the name of the new Cell Type.
4. Select the appropriate IR Operator from the drop-down menu (CedexXSCellOperator for analysis of cells or CedexXSObjectOperator for analysis of objects).
5. Click on the **Save** button. The **Cell Type** window will automatically close. The **Cell Type List** window will be active again and include the just-created Cell Type in the list.

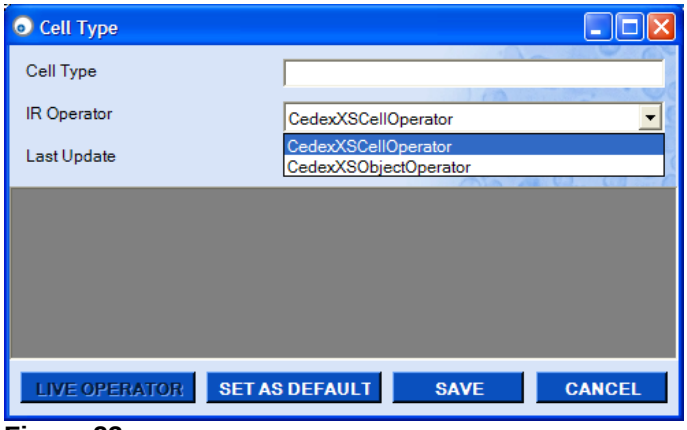


Figure 23
Cell Type window

To modify the parameters of the new Cell Type, do the following:

1. Highlight the row of the new Cell Type and click on the **Live Operator** button. The **Live Operator** window will open (see Figure 24).

2. In the **Data Source** area, select the new **Cell Type** to be modified from the drop-down list.
3. Select the **Reactor ID**, **Sample ID** and **Data Set** of the measurement for which the image analysis should be improved. The parameters for the loaded measurement are preset.
4. Select an image of the measurement in the **Image ID** section. This image will be loaded and displayed in the window in the upper right-hand corner with the living cells marked with a green circle and the dead cells marked with a red circle.
5. Make the desired modifications on a single parameter first (see “Description of the Individual Operator Parameters”). As soon as a parameter has been changed, reprocessing of the data is automatic. The image display then shows the reprocessed image (see “Working with the Live Operator”).
6. Continue to adjust parameters until an optimized adjustment of the Operator parameters has been found.
7. Click on **Save** to confirm the modifications for the new Cell Type.
8. Click on **Cancel** to close the **Live Operator** window without saving changes.

Editing an existing Cell Type

WARNING
An existing Cell Type can be modified. However, it is NOT advisable for data safety reasons to modify an existing Cell Type that has been used for measurements. A new Cell Type based on an existing Cell Type should be created instead.

Follow the instructions below to modify an existing Cell Type (**not advisable!**):

1. Select the Cell Type to be edited from the list of Cell Types at the top of the **Cell Type List** window and then click on the **Edit** button. The **Cell Type** window will open.
2. Click on the **Live Operator** button in order to modify the parameters for the Cell Type within the **Live Operator** window (see “Working with the Live Operator”).
3. Make the desired modifications on a single parameter first, then continue to adjust other parameters.
4. When an optimized adjustment of the Operator parameters has been found, click on **Save** to confirm the modifications.
5. Click on **Cancel** to close the window without saving any changes.

Viewing an existing Cell Type

Select the Cell Type to be viewed from the list of Cell Types at the top of the **Cell Type List** window and then click on the **View** button. The **Cell Type** window will open. Click on the **Live Operator** button in order to view the parameter settings for that Cell Type (see “Description of the Individual Operator Parameters”).

Deleting an existing Cell Type

Select the Cell Type to be deleted from the list of Cell Types at the top of the **Cell Type List** window and then click on the **Delete** button. A confirmation box will appear, asking the user if

he/she wants to delete the cell type. If confirmed, the Cell Type will be deleted and disappear from the list.

NOTE
All parameters of the measurements are logged. Deleted Cell Types have no influence on future measurements, but the parameters of deleted Cell Types used for past measurements will still appear in the printed reports of those measurements.

4.2 Working with the Live Operator

The **Live Operator** window can be opened via the **Cell Type List** window, the **Cell Type** window and the **Measurement** window. If the **Live Operator** button in a **Measurement** window containing specific results is clicked on, the **Live Operator** will open with an image of that measurement already loaded. If the **Live Operator** is opened via the **Cell Type** or **Cell Type List** windows, the first measurement in the **Measurement List** will be loaded.

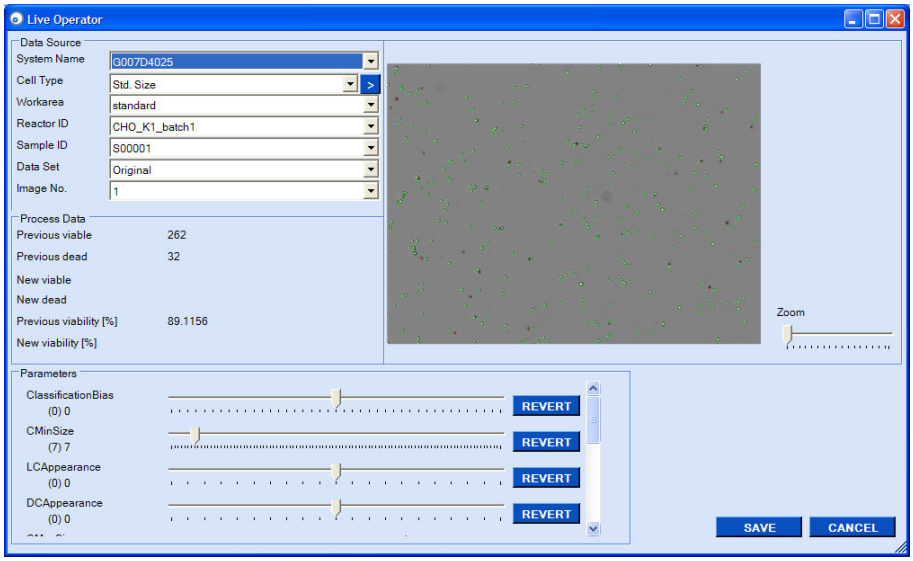


Figure 24
*Setting parameters for Cell Type **Std. Size***

CedexXSCellOperator and CedexXSObjectOperator parameters

The parameters available for the CedeXSCellOperator and the CedexXSObjectOperator are displayed on the screen in the **Live Operator** window when the appropriate Cell Type is selected. Parameters that are not immediately visible can be scrolled into view using the scroll bar under the Operator Parameter display. The tables below display the positions and settings of the 11 Operator parameters for the CedeXSCellOperator and the 5 parameters for the CedexXSObjectOperator. See also “Description of the Individual Operator Parameters” for a detailed description of each parameter.

Identifier	Minimum	Maximum	Std. Size (Default)	Min. Size (Default)
ClassificationBias	-20	20	0	0
CMinSize [µm]	0	200	7	1
LCAppearance	-20	20	5	12
DCAppearance	-20	20	5	12
CMaxSize [µm]	0	200	70	70
AggrMinSize [µm]	8	50	12	12
BorderWidth	0	1000	10	10
AggrMaxSize [µm]	10	200	100	100
LCAggrApp	-10	10	0	0
DCAggrApp	-10	10	0	0
MinPollutionArea [µm]	50	2000	200	200

Table 1
List of the CedexXSCellOperator parameters

Identifier	Minimum	Maximum	Objects (Default)
OMinSize [µm]	0	200	2
OMaxSize [µm]	0	200	200
OAppearance	-10	10	0
MinPollutionArea [µm]	50	2000	200
BorderWidth	0	1000	10

Table 2
List of the CedexXSObjectOperator parameters

After loading a measurement (Reactor ID and Sample ID) and selecting an image, the selected image is displayed in the upper right-hand corner of the **Live Operator** window. Each single cell detected by software is marked as dead (red circle) or living (green circle).

The values **New Viable** (the number of living cells of the current image) and **New Dead** (the number of dead cells of the current image) are displayed in the **Process Data** area. If an Operator parameter is modified, the newest values will appear under **New Viable** and **New Dead** after the automatic reprocessing of the selected image is finished. The values of the previous processing are displayed under **Previous Viable** and **Previous Dead**. Thus, direct comparison to each previous evaluation is possible. In addition, **New Viability** [%] shows the viability of the last processing of the image, while **Previous Viability** [%] shows the viability of the second-to-last processing of the image.

Description of the Individual Operator Parameters

ClassificationBias
Range: [-20, 20], Default: 0, Unit: [absolute value]
This parameter influences the classification behavior of viable and dead cells. Since dying cells of different cell lines absorb Trypan Blue differently, dead cells can be variably stained. Positive values of this parameter tend to let the operator recognize more living cells and less dead cells. Negative values cause the opposite effect, with more dead cells and less living cells being recognized. This parameter's default setting is optimized for dark-looking dead cells and living cells with a bright cell interior.

An example of a possible need for a change to a more negative value would be a cell line that poorly absorbs Trypan Blue when dead or dying. In the default setting with the value 0, these cells would still often be recognized as living. If the value is changed to negative value,

however, more dark objects would be counted as dead cells. The viability recorded would, therefore, be reduced.

CMinSize. [µm] (Cells' minimum size)
Range: [0, 200], Default: 7, Unit: [micrometer]
This parameter determines the minimum cell size (diameter values measured in micrometer). It serves the purpose of discerning debris from cells.

LCAppearance (Live Cells' Appearance)
Range: [-20, 20], Default: 5, Unit: [absolute value]
This parameter influences the recognition of living cells. When the value of this parameter is set high, contrast-weak objects are also counted as living cells provided they additionally fulfill the size criterion. The lower this value is set, the more contrast an object must have for it to be counted as a viable cell. If the value is changed to positive, shadowy and greyish objects are increasingly counted as living cells. Such a change can be sensible if, for example, the optical image shows little contrast due to the structure of the medium or of the cells in the medium.

DCAppearance (Dead Cells' Appearance)
Range [-20, 20], Default 5, Unit [absolute measure]
This parameter influences the recognition of dead cells. If the value is set high, contrast-weak objects are also counted as dead cells as long as they additionally fulfill the size criterion. The lower this value is set, the sharper the contrast an object must have in order to be counted as a dead cell.

NOTE
In standard situations a change of this parameter can result in the labeling of debris as cells!

CMaxSize [µm] (Cells' Maximum Size)
Range: [0, 200], Default: 70, Unit: [µm]
This parameter serves the purpose of setting the maximum cell size (diameter in micrometer) used for considering objects for evaluation. It distinguishes large dirt particles from cells.

AggrMinSize [µm] (Aggregate Minimum Size)
Range: [8, 50], Default: 12, Unit: [µm]
The minimum size of the region that should be analyzed as an aggregate is given here.

BorderWidth [pixel]
Range: [0, 20], Default: 10, Unit: [Pixel]
The border frame around the image not used for evaluation.

NOTE
This parameter should not be changed!

AggrMaxSize [µm] (Aggregate Maximum Size)
Range: [10, 200], Default: 100, Unit: [µm]
The maximum size of the region that should be analyzed as an aggregate is given here.

LCAggrApp (Live Cells' Aggregate Appearance)
Range: [-10, 10], Default: 0, Unit: [Absolute value]
This parameter influences the recognition of living cells in aggregates. The higher this value is set, the more living cells are recognized in aggregates. The lower this value is set, the fewer living cells that are recognized in aggregates.

DCAggrApp (Dead Cells' Aggregate Appearance)
Range: [-10, 10], Default: 0, Unit: [Absolute value]
This parameter influences the recognition of dead cells in aggregates. The higher this value is set, the more dead cells are recognized in aggregates. The lower this value is set, the fewer dead cells that are recognized in aggregates.

MinPollutionArea [µm] (Minimum Pollution Area)
Range: [50, 1000], Default: 200, Unit: [µm]
This parameter determines when an image will not be analysed, i.e. the size (diameter in micrometer) that an object (e.g. dirt or bubbles) must have for an image to no longer be analyzed is given here.

NOTE
The use of the sliders, especially in combination, can lead to unexpected results.

5 Data Management

5.1 Printing Reports

Print Report buttons can be found in all the appropriate windows (e.g. **Measurement List**, **Cultivation Time Chart, Measurement** window etc.). In addition, a **Report** menu is also available on the menu bar of the **Cedex XS Control Center**. This menu serves as direct access to the report functionality for many of the different reports.

The following information can be printed out via the **Report** menu:

- **Operational data**
  Allows the user to track the device's operating hours, number of measurements and liquid consumption.
- **Measurement data**
  Contains information about measurement parameters and calculated results, e.g. sample identification data, name and parameters of the Cell Type used, calculated measurement result data etc.
- **System configuration parameters**
  Provides a statement of system parameters as displayed in the **User Preferences**.

5.2 Export to File

There are various possibilities for exporting measurement data displayed in the **Measurement List** window. Exporting data is done via the **Export to file** area of the **Measurement List** window. Four different formats can be chosen including CSV, XML, Excel-DIF and Flat file. In addition, a sub-set of parameters to be included in the file can be selected.

To export measurement series data to a file, follow the instructions below:

1. Select the **Export to file** option in the **Functions** menu of the **Control Center**. The **Measurement List** window will appear with the **Export to File** button located at the bottom of the window.
2. Select a single measurement from the list by clicking on the field to the left of the desired line. To choose a set of measurements, hold down the **<**Ctrl**>** button while selecting the appropriate lines. Alternatively, the desired measurements can be searched for using different filter criteria (see "Searching for measurements").
3. Click on **Export to File**. The **Export** window will open (see Figure 25).
4. In the **Export** window, individual **Parameter** and **String delimiters** can be defined (this only applies to CSV and Flat files).
5. In the **Location** area, the target path to be used for storage of the export file is entered. The button on the right of the entry field opens a window in which the path can be selected directly. The name of the file will be generated automatically.
6. To specify a sub-set of parameters to be exported, either click the check-boxes next to the preset options (i.e. **All Parameters**, **Cell Data** and **Overall Results**) or select the desired parameters from the **Columns to Export** area. To choose a set of parameters, keep the **<**Ctrl**>** button pressed while making selections.
7. In the **File format** area, select the file format by clicking on the appropriate check-boxes. The files will automatically receive *.dif or *.csv file name extensions.

8. Click on the **Export Selected Data** button.
9. A Cedex message window will appear to confirm successful export of information. Click on **OK** to confirm the message.

The measurement data can then be viewed in the file created.

NOTE

The file format **Excel-DIF** should always be chosen if a file is to be exported into Excel.

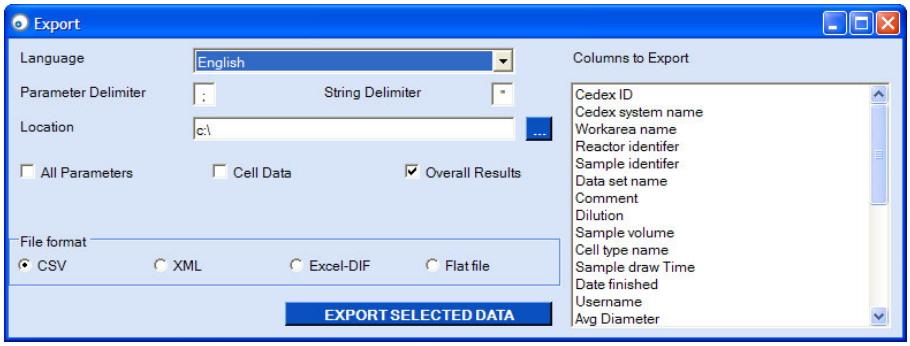


Figure 25
The Export window

5.3 Data Exchange

The Data Exchange function allows for the exchange of measurement data between different Cedex System databases (DBs). The user can export selected data from one Cedex System DB and import it into another.

Export

In order to exchange data between systems, the data first needs to be exported from the system on which it was created to external storage. To export data, proceed as follows:

1. Select the **Data Exchange** option in the **Functions** menu of the **Cedex XS Control Center**.
2. Select **Export**. The **Measurement List** window will appear with an **Export to DB** button located at the bottom of the window.
3. Select a single measurement from the list by clicking on the field to the left of the appropriate line. To choose a set of measurements, hold down the **<Ctrl>** button while selecting the appropriate lines. Alternatively, the desired measurements can be searched for using filter criteria.
4. Click on **Export to DB** to open the **Export** window.
5. The path under which the export file should be stored is entered in the **Location** area. The button ... on the right of the entry field opens a window in which the path of the database file can be selected directly.
6. Click on **Export** to start the exporting process. A Cedex message window will appear as soon as export has been successfully completed. Click on **OK**.
7. Close the **Export** window by clicking on .

A default entry for the path under which the export file should be stored can be entered in the **User Preferences** under the **Setup** menu. Open the **Data Exchange** tab and look for the **ExportPath** parameter. In the **Value** column, enter the default path.

Import

Once measurement data has been exported from one system to external storage, the data can then be imported to another system. To import measurement data into a Cedex System, follow the instructions below:

1. Select the **Data Exchange** option in the **Functions** menu on the **Cedex XS Control Center**.
2. Click on **Import** to open the **Import from External DB** window.
3. Select the path of the file that is to be imported in the **Location** area. The button on the right of the entry field opens a window in which the path of the file can be selected directly. Click on **Open**. The **Import from External DB** window will reappear.
4. Click on the **Import** button to start the import process. A Cedex message window will appear when the import is successfully completed. Click on **OK**.
5. Close the **Import from External DB** window by clicking on .

A default entry for the path under which the import file should be stored can be entered in the **System Options** under the **Setup** menu. Open the **Data Exchange** tab and look for the **ImportPath** parameter. In the **Value** column, enter the default path.

To view imported measurements having a different System ID, select the appropriate system name for those measurements in the **System Name** drop-down menu in the **Measurement List** window.

5.4 Archiving Data

The objective of the archive function is to secure measurement data by exporting it to external storage media. Measurement data must be secured at regular intervals and thereafter deleted from the **Measurement List** in order to ensure enough storage capacity on the Cedex XS computer. All data from a single or a set of measurements, or optionally only the images, can be deleted once the data has been archived. Measurement data can later be restored from the archive. All data should also be backed up on a regular basis.

Archive

To archive measurement data, proceed as follows:

1. Open the **Functions** menu in the **Control Center** and select the **Archive** function found within the **Archiving** menu. The **Measurement List** window will appear with an **Archive** button at the bottom of the window.
2. Select a single measurement from the list by clicking on the field on the left of the appropriate line. When choosing a set of measurements, hold the **<**Ctrl**>** button down while selecting the appropriate lines. In addition, the desired measurements can be searched for using various filters (see the section “Using the Measurement List”).
3. Click on **Archive** to open the **Archive** window.

4. The path under which the archive file should be stored is entered in the **Location** area. The button on the right of the entry field opens an explorer window in which the path can be selected directly. A file name for the data to be archived needs to be entered.
5. Click on **Save**. The Archive window will reappear.
6. Click on the **Archive** button to start the archiving process. A message window will appear as soon as archiving of information is completed successfully. Click on **OK**.
7. Close the **Archive** window by clicking on .

A default entry for the path under which the archive file should be stored can be entered in the **User Preferences** under the **Setup** menu. Open the **Data Exchange** tab and look for the **ArchivePath** parameter. In the **Value** column enter the default path.

Restore

To restore measurement data, follow the instructions below:

1. Select the **Restore** function within the **Archiving** menu to open the **Restore** window.
2. The path of the file that is to be restored is entered in the **Location** area. The button on the right of the entry field opens an explorer window in which the path of the file can be selected directly.
3. Click on **Open**. The **Restore** window will reappear.
4. Click on **Restore** to start the restoring process. A message window will appear as soon as the information has been restored successfully. Click on **OK**.
5. Close the **Restore** window by clicking on .

Deleting archived data

Only data that has been archived can be deleted from the Cedex XS Database. Archived data can be searched for and displayed in the upper right-hand corner of the **Measurement List** window.

To delete archived data, do the following:

1. Click on the **Archived measurements(s)** check box in the upper right-hand corner of the **Measurement List** window. The list of archived measurements will appear.
2. Highlight measurements to be deleted by clicking on the field on the left of the appropriate line. When choosing a set of measurements, hold the **<**Ctrl**>** button down while selecting the appropriate lines.
3. Click the check-box beside **Delete records** if all measurement data is to be deleted from the system Database. If the option **Delete only images** is chosen, all data apart from the images will stay in the system Database.
4. Click on the **Delete** button to delete selected measurements.

5.5 Securing Data

In order to always have enough storage capacity on the Cedex XS computer, measurement data must be secured at regular intervals.

6 User Preferences

The **Cedex XS Control Center** offers users the option to modify default values for a variety of parameters via the **User Preferences** option in the **Master Data** menu.

Specifying Default Measurement Parameters

Preferred default values for certain measurement parameters (cell type, process type, dilution, etc.) can be set in the **User Preferences** window. Follow the instructions below to change the default values:

1. Select **User Preferences** in the **Master Data** menu of the **Control Center**. This will open the **User Preferences** window.
2. Select the **Measurement** tab in the **User Preferences** window (see Figure 26).
3. Manually type in the appropriate default measurement parameters in the **Value** column. The defaults for the following parameters can be determined:
   - MeasurementPrecision
   - CellType
   - ReactorID
   - SampleID
   - SampleInitialDilution
4. Put a check mark in the check-box of the **Save Last** column if the last value used for a measurement should be used as the default for the next measurement.
5. Click on **Save** to confirm.
6. Close the window. The new default parameters will apply to new measurements.

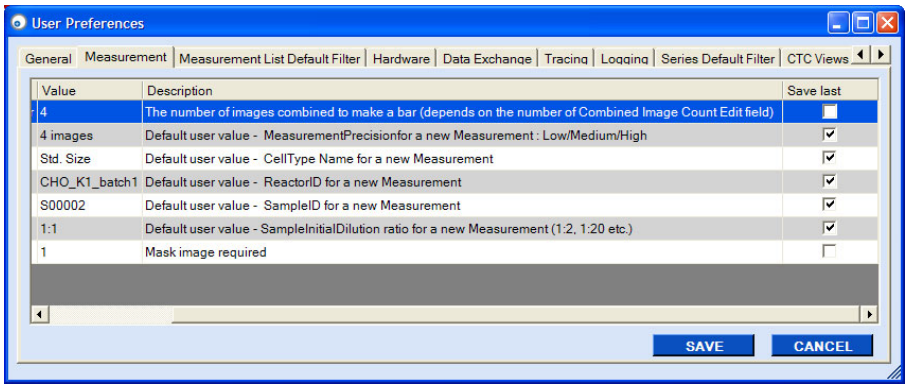


Figure 26
User Preferences window

Specifying other Default Parameters

The following tabs are also found in the **User Preferences** window. For more detailed information about the parameters, see “List of User Preferences” in the Appendix.

- **General**: General software and hardware settings
- **Measurement**: Create or alter default parameters for settings in the **Measurement** window

- **Measurement List Default Filter**: Create or alter default parameters for filter settings in the **Measurement List** window
- **Hardware**: General hardware settings
- **Data Exchange**: Create or alter default parameters for Export, Import and Archive functions
- **Tracing**: Change the default output path for the tracing
- **Logging**: Change the default output path for logging
- **Series Default Filter**: Create or alter default parameters for the filter settings in the **Selection of Data Series** window
- **CTC Views Default Filter**: Create or alter default parameters for the filter settings in the **CTC Views** window
- **Reports**: Create or alter default paths for reports

WARNING
Many of the parameters in the **User Preferences** must not be changed without prior arrangement with Roche Innovatis AG. Explicit notes have been attached to the descriptions of those parameters (see list of User Preferences in the Appendix). In all cases, Roche Innovatis AG Service and Support must be contacted before any changes are made to those parameters.

7 Additional Hardware and Software Elements

Checking the Live View of the sample chamber

The sample chamber that is in position under the microscope can be viewed via the **Live View** button in the **Shortcuts** area of the **Cedex XS Control Center** (see Figure 27).

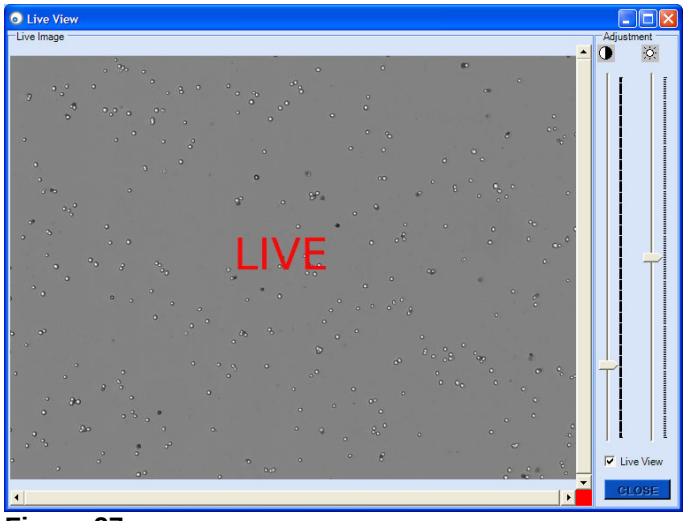


Figure 27
The Live View of a sample chamber

Certain areas of the Live View can be enlarged by following the instructions below:

1. Place the mouse pointer on the top left-hand corner of the area to be enlarged.
2. Hold the left mouse button pressed down and move it to the lower right-hand corner of the area to be enlarged.
3. Release the mouse button and the selected area will fill the whole window.

Return to the original size of the chart by following the instructions below:

1. Place the mouse pointer anywhere on the diagram.
2. Hold the left mouse button pressed down and form a box from the bottom right corner to the upper left corner.
3. Release the mouse button. The chart will then return to in its original size.

The brightness and contrast of the image can also be changed for a better analysis.

Operational Data

The Cedex XS System keeps track of some operational data including operating hours and number of measurements. Select **Operational Data** in the **Functions** menu of the **Cedex XS Control Center** to open the **Operational Data** window.

The values on the left-hand side of the window can be set to 0 by clicking on the **Reset** button. This can be useful for tracking the operational information for short periods of time. The values on the right-hand side track the overall operating hours and number of measurements. These values cannot be reset.

A report of the operational data can be printed out via the **Print Report** button.

Performing a HW Startup and HW Shutdown

The **HW Startup** initializes all of the hardware-dependent software modules. The **HW Startup** is automatically carried out when the software is launched. However, the hardware management can be manually shut down via the **HWM** button in the **Shortcuts** area of the **Cedex XS Control Center**. When the Hardware Management is shut down, several modules are not yet initialized. A **HW Startup** must be done before a measurement can be performed. If a measurement is attempted before the Hardware Management has been started, an error message will appear, "**Cannot start a new process: Hardware Management is not started**".

Follow the instructions below to perform a **HW Startup**:

1. Click on the **HWM** button in the Cedex XS Control Center or else select **Hardware Management** under the **Functions** menu. The **Hardware Management** window will open (see Figure 28).
2. If the Hardware Management has not been started, the **HW STARTUP** button will be active, while the **WHITE BALANCE** and **HW SHUTDOWN** buttons will be inactive.
3. Click on **HW STARTUP**. The Hardware Management will start and the **WHITE BALANCE** and **HW SHUTDOWN** buttons will become active.
4. Click on ☒ to close the window.

Follow the instructions below to carry out a **HW Shutdown**:

1. Click on the **HWM** button in the **Shortcuts** area of the **Control Center** to open the **Hardware Management** window.
2. Click on the **HW Shutdown** button in the lower right-hand corner of the window to shut down the Hardware Management.
3. Click on ☒ to close the window.

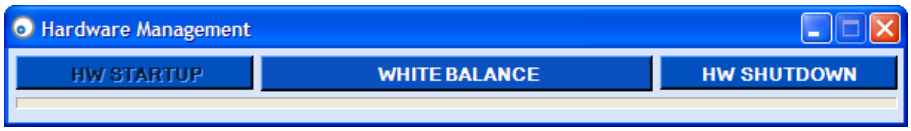


Figure 28
Hardware management window

Performing a White Balance

If the brightness in an image is uneven, a **White Balance** should be carried out. The White Balance determines the proper adjustment for image brightness. To carry out a White Balance, do the following:

1. Pull the slide carrier completely out of the Cedex XS.
2. Click on the **HWM** button in the **Shortcuts** area of the **Control Center** to open the **Hardware Management** window.
3. Click on the **White Balance** button in the middle. The White Balance will be carried out and the results will be automatically saved.
4. When the White Balance is finished, the **White Balance** button will be active again.
5. Click on ☒ to close the window.

8 Appendix

Contact Addresses

Manufacturer

Roche Diagnostics Ltd.
Forrenstrasse
CH-6343 Rotkreuz
Switzerland

Distribution

Roche Diagnostics GmbH
Sandhofer Straße 116
D-68305 Mannheim
Germany

Distribution in USA

Roche Diagnostics
9115 Hague Road
PO Box 50457
Indianapolis, IN 46250
USA

Support

Please contact your local Roche representative for assistance.

Questions or comments regarding the contents of this manual can be directed to the address below or to your local Roche representative.

Roche Innovatis AG
Meisenstr. 96
33607 Bielefeld
Germany

Phone: +49(0)521 2997 298

Fax: +49(0)521 2997 285

email: support.innovatis@roche.com

internet: www.roche.com

Technical Specifications

Cedex XS Analyzer

Operating environment	Indoor use only
Method of measurement	Digital image and pattern recognition
Viable/dead cell differentiation	Trypan Blue exclusion method
Detectable cell concentration range	1 x 10^4 - 1 x 10^7 cells per mL
Detectable cell diameter range	5 µm – 180 µm
Detectable object diameter range	2 µm - 180 µm
Required sample volume	Sample 5 µL Trypan Blue 5 µL
Average measurement period	20 sec
Geometric optical resolution	0.86 µm/Pixel
Sample chamber height	195 µm
Operating temperature (Optimal image quality is achieved between 20°C and 30°C)	+10°C to +40°C (+50°F to +100°F)
Maximum temperature change	5°C per hour
Maximum humidity deviation	5% per hour
Operating humidity	20% to 80% relative humidity (non-condensing)
Operational altitude	Up to 2000 m
Dimensions Height: Width: Depth: Weight:	345 mm 157 mm 248 mm 7.85 kg
Energy requirements	100 - 240 VAC +/- 10%, 47 - 63 Hz, 0.9 – 0.34 A
Voltage and current rating	12 Vdc; 0.3 A
Replacement fuse type	T 0.315 A 250 V
Pollution degree	2 (according to IEC 61010-1)
Installation category	II (according to IEC 61010-1)

Hardware Features for the Cedex XS Computer

Computer	x86-Architecture, Intel Pentium IV minimum 2 GHz required
Operating system	Windows® XP Professional Windows Vista™ Home Premium Windows Vista™ Business
RAM (Recommended)	Windows® XP 1 GB Windows Vista™ 2 GB
Hard-disk storage	Minimum 20 GB free hard-disk storage
USB 2.0 port	1 free port
CD/DVD Drive	CD-ROM Drive required

List of User Preferences

The following list provides a description of all of the user preferences found in the Cedex XS Software via the **User Preferences** window under the **Setup** menu of the Cedex Control Center.

If the column **SaveLastValue** has been selected for a particular parameter (i.e. there is a checkmark in the column), any new value entered in the corresponding location will be automatically saved in the **User Preferences** windows. For example, the user has set the default for the **Cell Type** in the **Measurement** section of the **User Preferences** window to “CT1” and has activated the **SaveLastValue** option. If the user then changes the **Cell Type** parameter to “CT2” when running a new measurement, “CT2” will be automatically saved as the new default in the **User Preferences** window and will be automatically recommended for the next measurement. The **SaveLastValue** function can be activated for all options in the **User Preferences** window. The parameters for which the last value is saved by default are marked below in grey.

WARNING

Many of the elements in the **User Preferences** must not be changed without prior arrangement with Roche Innovatis AG. Those parameters that should not be changed have been explicitly marked with a warning in the description of the preferences below. In all cases, Roche Innovatis AG Service and Support must be contacted before any changes are made to those parameters.

GENERAL

Option	Value	Description	Save last value
ErrorLevelDisplayToUser	3	Lowest level of error messages to be displayed to the user (1-Fatal/2-Critical/3-Error/4-Warning)	
CellDistMin	3.0	Minimum cell distance [µm] for which cells are ascertained to be single cells with regard to the determination of the aggregate rate. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
CellDistRatio	1.3	Minimum relationship of the cell distance to the sum of the radii used for which cells are ascertained to be single cells with regard to the determination of the aggregate rate. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
CertificateStore	My	Name of the certificate storage from which the certificate for the check of the license and the signature for the archive is searched. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
FlowFactor	1.00	Correction factor regarding movement of liquid. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
InnovatisCertificate	Innovatis AG Test	Specification of the certificate to be used for inspection of the license. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
JpegQuality	95	JPEG image encoder quality. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
OverallTypeForExponential	ViableCellDensity	(not adjustable) Overall Type for the exponential regression used for the determination of doubling time and	

Option	Value	Description	Save last value
Regression		specific growth rate.	
MaxCellDensity	5000000	Cell density warning level. Maximum total cell concentration in an image without the dilution applied.	
HistogramBarWidth	2	The width of the histogram bars	
CriticalDiskSpace	1	The limit for the free memory space on the non-removable disk (in gigabyte). The user is warned when executing a measurement if the space is below this limit.	
DataBaseDriveMap Name	C:	The drive on which the database is located (this will, for example, be used for checking the free disk space, see "CriticalDiskSpace"). **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	

MEASUREMENT

Option	Value	Description	Save last value
CellType	Std. Size	Default Cell Type for measurements.	
Measurement Precision	1 image	Default precision for the measurement : low/medium/high	X
ReactorID		Default ReactorID for measurements.	X
SampleID		Default SampleID for measurements.	X
SampleInitialDilution	1:2	Default dilution factor for measurements. (1:2, 1:20 etc.)	X
Mask image required	1	Mask image required	X
Sample volume default	50	Default sample volume used for calculating final dilution	X
Dye volume default	50	Default dye volume used for calculating final dilution	X
Diluent volume default	0	Default diluent volume used for calculating final dilution	X

MEASUREMENT LIST DEFAULT FILTER

Option	Value	Description	Save last value
CellType		Measurement List Default Filter for CellType	X
ProcessDate From		Measurement List Default Filter for Process Date From	X
ProcessDateTo		Measurement List Default Filter for Process Date To	X
ReactorID		Measurement List Default Filter for ReactorID	X
SampleDrawing DateFrom		Measurement List Default Filter for Sample Drawing Date From	X
SampleDrawing DateTo		Measurement List Default Filter for Sample Drawing Date To	X
SampleID		Measurement List Default Filter for SampleID	X
DataSetType	Effective	Measurement List Default Filter for DataSet: Effective/Original/All	X
DataSet		Measurement List Default Filter for DataSet	X

HARDWARE

Option	Value	Description	Save last value
ChamberHeight	0.2	Height of the measurement sample chamber. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
PixelsPermmX	1157	(not adjustable) Number of pixels per millimeter in the x-axis of the images taken.	
PixelsPermmY	1157	(not adjustable) Number of pixels per millimeter in the y-axis of the images taken.	
Background reference color	128	Reference gray value used for background correction **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
Brightness channels	B	Channels to be used for background correction (R=red, G=green, B=blue) **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
Background target value	160	Reference target value for use with mask image **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	

DATA EXCHANGE

Option	Value	Description	Save last value
ExportCertificate	Innovatis AG Archive Test	Certificate that should be used for the designation and examination of archives for Data Exchange (Export/Import).	
ExportDelimiter	;	Default value separator for the CSV/Excel export of measurements.	
ExportPath	c:\	Default for the path that should be used for the Data Exchange export.	
ExportSTring Delimiter	“	Default for the export file string delimiter	
ArchiveCertificate	Innovatis AG Archive Test	Certificate that should be used for the designation and examination of archives for Archive/Restore. **Warning**: Do not change this parameter without consulting with Roche Innovatis AG!	
ArchivePath	c:\	Default path that should be used for Archive/Restore.	
ImportPath	c:\	Default for the path that should be used for the Data Exchange import.	
Measurement ExportFileName	Measurement Export.txt	Default file name for CSV/Excel export of measurement results.	
AuditTrailExport FileName	AuditTrailExp ort	Default file name for the CSV export of Audit Trail entries.	
ArchiveFileMask	{8}-{5}-{6}	Archive file name mask (parameters {0} –{9} can be used	
CTCExportFile Name	CTCExport	Default file name for exported CTC files.	

TRACING

Option	Value	Description	Save last value
TraceOutputPath	C:\Cedex2\CedexTrace.txt	Default file name for the trace file.	

LOGGING

Option	Value	Description	Save last value
LogOutputPath	C:\Cedex2\CedexLog.log	Default file name for the log file.	

SERIES DEFAULT FILTER

Option	Value	Description	Save last value
DataSet		CTC Series New Default Filter for DataSet	X
MeasurementDateFrom		CTC Series List Default Filter for Measurement Date From	X
MeasurementDateTo		CTC Series List Default Filter for Measurement Date To	X
ReactorID		CTC Series List Default Filter for ReactorID	X

CTC VIEWS DEFAULT FILTER

Option	Value	Description	Save last value
ModifyDateFrom		CTC Views Default Filter for Measurement Modify Date From	X
ModifyDateTo		CTC Views Default Filter for Measurement Modify Date From	X
ViewName		CTC Views Default Filter for View name	X
CreateDateFrom		CTC Views Default Filter for Measurement Create Date From	X
CreateDateTo		CTC Views Default Filter for Measurement Create Date To	X

REPORTS

Option	Value	Description	Save last value
ReportResultPath		Report result .xml path	X
ReportTemplatePath		The path to report templates (files extension *.lst)	

REPORT SETTINGS

Option	Value	Description	Save last value
Operational Data Report Template	standard	Default report template for the report type “Operational Data”	
Measurement Data Report Template	standard	Default report template for the report type “Measurement Data”	
System Configuration Report Template	standard	Default report template for the report type “System Configuration”	
Diagnosis Report Template	standard	Default report template for the report type “Diagnosis”	
CTCData Report Template	standard	Default report template for the report type “CTCData”	

Cleaning

The cleaning can be performed with 80% ethanol.

Maintenance

No maintenance is required.

Disposal Recommendations

Symbol:

	Electrical and electronic equipment marked with this symbol are covered by the European directive WEEE. The symbol denotes that the equipment must not be disposed of in the municipal waste system.

(WEEE) Directive 2002/96/EC of the European Parliament and the Council of 27 January 2003 on waste electrical and electronic equipment.

Disposal Recommendations

All electrical and electronic products should be disposed of separately from the municipal waste system. Proper disposal of your old appliance prevents potential negative consequences for the environment and human health.

Disposal of the Instrument

	The instrument must be treated as biologically contaminated-hazardous waste. Final disposal must be organised in a way that does not endanger waste handlers. As a rule, such equipment must be sterile before it is passed on for final disposal. For more information contact your local Roche Support personnel.

Disposal of Control Unit Components

	Components of your Control Unit such as the computer, monitor, keyboard, etc. which are marked with the crossed-out wheeled bin symbol are covered by the European Directive 2002/96/EC (WEEE). These items must be disposed of via designated collection facilities appointed by government or local authorities. For more information about disposal of your old product, please contact your city office, waste disposal service or your local Roche Support personnel.

Constraint It is left to the responsible laboratory organization to determine whether control unit components are contaminated or not. If contaminated, treat in the same way as the instrument.

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